MATHEMATICS – P1

LAST PUSH

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Porofensie Ya Kapa Botjahabela: Lefapha la Thuto

NATIONAL SENIOR CERTIFICATE
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GRADE/*GRAAD* 12

SEPTEMBER 2026

MATHEMATICS P1 MARKING GUIDELINE /
WISKUNDE V1 NASIENRIGLYN

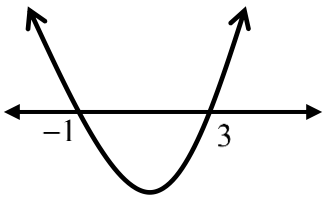
MARKS/*PUNTE*: 150

This marking guideline consists of 15 pages./
Hierdie nasienriglyn bestaan uit 15 *bladsye*.

NOTE/*LET OP*:

- If a candidate answered a question TWICE, mark the FIRST attempt ONLY.
  Indien 'n kandidaat 'n vraag TWEE keer beantwoord het, merk SLEGS die EERSTE poging.
- Consistent accuracy(CA) applies in ALL aspects of the memorandum.
  Volgehoue akkuraatheid geld deurgaans in ALLE aspekte van die memorandum.
- If a candidate crossed out an attempt of a question and did not redo the question, mark the crossed-out attempt.
  Indien 'n kandidaat 'n poging vir 'n vraag deurgetrek het en nie die vraag weer beantwoord het nie, merk die poging wat deurgetrek is.
- The mark for substitution is awarded for substitution into the correct formula.
  Die punt vir substitusie word toegeken vir substitusie in die korrekte formule.

QUESTION/*VRAAG 1*

1.1	1.1.1	$2x(x-3)=0$ $2x=0$ or/*of* $x-3=0$ $x=0$ or/*of* $x=3$	✓ factors / *faktore* ✓ both answers / *beide antwoorde* (2)
	1.1.2	$2x^2+5x+1=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $x=\frac{-(5)\pm\sqrt{(5)^2-4(2)(1)}}{2(2)}$ $x=\frac{-5\pm\sqrt{17}}{4}$ $\therefore x=-0,22$ or / *of* $x=-2,28$ Penalise 1 mark for incorrect rounding off./ *Penaliseer* 1 *punt vir verkeerde afronding.*	✓ standard form / *standaardvorm* ✓ substitution / *vervanging* ✓answer / *antwoord* ✓ answer / *antwoord* (4)
	1.1.3	$-x^2+2x+3>0$ $x^2-2x-3<0$ $(x-3)(x+1)<0$ *c.v's / kritieke waardes* : $x\in\{-1;3\}$  $-1<x<3$	✓ standard form / *standaardvorm* ✓ critical values / *kritieke waardes* ✓✓ $-1<x<3$ (accuracy / *akkuraatheid*) **OR/*OF*** ✓✓ $x\in(-1\ ;\ 3)$ (4)

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	1.1.4	$25^x - 26.5^x + 25 = 0$ $\left(5^x\right)^2 - 26.5^x + 25 = 0$ $\left(5^x - 25\right)\left(5^x - 1\right) = 0$ $5^x = 25$ or / *of* $5^x = 1$ $5^x = 5^2$ or / *of* $5^x = 5^0$ $x = 2$ or / *of* $x = 0$ **OR / *OF*** $\left(5^x\right)^2 - 26.5^x + 25 = 0$ let / *laat* : $5^x = k$ $k^2 - 26k + 25 = 0$ $(k - 25)(k - 1) = 0$ $k = 25$ or / *of* $k = 1$ $5^x = 5^2$ or / *of* $5^x = 5^0$ $x = 2$ or / *of* $x = 0$	✓ quadratic form / *kwadratiese vorm* ✓ factors/ *faktore* ✓ both equations / *beide vergelykings* ✓ both answers / *beide antwoorde* **OR/*OF*** ✓ quadratic standard form/ *kwadratiese standaardvorm* ✓ factors/ *faktore* ✓ both equations (after substitution)/ *beide vergelyking (na vervanging)* ✓ both answers / *beide antwoorde* (4)

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1.2	$2x-y=1$ .....(1) $x^2-y^2=xy-11$ .....(2) From / *Vanaf* (1) : $y=2x-1$ .....(3) (3) into/*in* (2) : $(2x-1)^2-(2x-1)^2=x(2x-1)-11$ $x^2-(4x^2-4x+1)=2x^2-x-11$ $x^2-4x^2+4x-1=2x^2-x-11$ $-5x^2+5x+10=0$ $x^2-x-2=0$ $(x-2)(x+1)=0$ $x=2$ or/*of* $x=-1$ $y=3$ or/*of* $y=-3$ **OR / OF** 2x - y = 1 .....(1) $x^2-y^2=xy-11$ .....(2) From / *Vanaf* (1) : $x=\frac{y+1}{2}$ .....(3) (3) into/*in* (2) : $\left(\frac{y+1}{2}\right)^2-y^2=\left(\frac{y+1}{2}\right)y-11$ $\frac{(y+1)^2}{4}-y^2=\frac{y(y+1)}{2}-11$ $\frac{y^2+2y+1}{4}-y^2=\frac{y^2+y}{2}-11$ $y^2+2y+1-4y^2=2y^2+2y-44$ $-5y^2=-45$ $y^2-9=0$ $(y-3)(y+3)=0$ $y=3$ or/*of* $y=-3$ $x=2$ or/*of* $x=-1$	✓ $y=2x-1$ ✓ substitution / *vervanging* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ *x*-values / *waardes* ✓ *y*-values / *waardes* **OR/*OF*** ✓ $x=\frac{y+1}{2}$ ✓ substitution / *vervanging* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ *y*-values / *waardes* ✓ *x*-values / *waardes* (6)

1.3	$m\left(n\left(x\right)\right)=\frac{1}{2}$ $\left(3\left(\frac{x+2}{\sqrt{x+5}}\right)-2\right)\div\left(4\left(\frac{x+2}{\sqrt{x+5}}\right)\right)=\frac{1}{2}$ $\left(\frac{3x+6}{\sqrt{x+5}}-2\right)\div\left(\frac{4x+8}{\sqrt{x+5}}\right)=\frac{1}{2}$ $\frac{3x+6-2\sqrt{x+5}}{\sqrt{x+5}}\times\frac{\sqrt{x+5}}{4x+8}=\frac{1}{2}$ $\frac{3x+6-2\sqrt{x+5}}{2\left(2x+4\right)}=\frac{1}{2}$ $2x+4=3x+6-2\sqrt{x+5}$ $2\sqrt{x+5}=x+2$ $4x+20=x^2+4x+4$ $x^2-16=0$ $\left(x+4\right)\left(x-4\right)=0$ $x=4$ or/*of* $x\neq-4$	✓ substitution /*vervanging* ✓ adding fractions / *optel van breuke* ✓simplification/ *vereenvoudiging* ✓ standard form / *standaardvorm* ✓ answer with selection *antwoord met keuse* (5)
		[25]

QUESTION/*VRAAG 2*

2.1	2.1.1	7; 16; 25; 34;..... $a=7$ and $d=9$ $T_n=7+\left(n-1\right)\left(9\right)$ $=7+9n-9$ $=9n-2$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
	2.1.2	$T_{35}=9\left(35\right)-2$ $=313$	✓ answer / *antwoord* (1)
	2.1.3	$S_{35}=\frac{35}{2}\left[2\left(7\right)+\left(35-1\right)\left(9\right)\right]$ $=5\ 600$ **OR / *OF*** $S_{35}=\frac{35}{2}\left(7+313\right)$ $=5\ 600$	✓ substitution / *vervanging* ✓ answer / *antwoord* **OR/*OF*** ✓ substitution / *vervanging* ✓ answer / *antwoord* (2)

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	2.1.4	$8\,600 = \frac{n}{2}\left[2(7)+(n-1)(9)\right]$ $17\,200 = n(14+9n-9)$ $17\,200 = n(9n+5)$ $17\,200 = 9n^2+5n$ $9n^2+5n-17\,200 = 0$ $n = \frac{-5 \pm \sqrt{(5)^2-4(9)(-17200)}}{2(9)}$ $n = 43,44$ or / *of* $n = -43,99$ $\therefore n = 43$	✓ equating 8 600 to S_n *Stel* $S_n = 8\,600$ ✓ simplification / *vereenvoudiging* ✓ substitution / *vervanging* ✓ answer / *antwoord* (4)
2.2	2.2.1	Side $= \frac{1}{2}$ units/ *eenheid*	✓ answer / *antwoord* (1)
	2.2.2	$\left(\frac{1}{2}\right)^2 = \left(\frac{1}{4}\right)^2 + h^2 \quad (\text{Pyth.})$ $h = \frac{\sqrt{3}}{4}$ Area $= \left(\frac{1}{2}\right)^2 \times \frac{\sqrt{3}}{4}$ $= \frac{\sqrt{3}}{16}\text{units}^2$ / *eenhede*^{2}	✓ height / *hoogte* ✓ area / *oppervlakte* (2)
	2.2.3	$\left(\frac{1}{4}\right)^2 = \left(\frac{1}{8}\right)^2 + h^2 \quad (\text{Pyth.})$ $h = \frac{\sqrt{3}}{8}$ Area $= \frac{1}{2} \times \frac{1}{4} \times \frac{\sqrt{3}}{8}$ $= \frac{\sqrt{3}}{64}\text{units}^2$ / *eenhede*^{2} $\frac{\sqrt{3}}{4} + \frac{\sqrt{3}}{16} + \frac{\sqrt{3}}{64} + \ldots$ $a = \frac{\sqrt{3}}{4}$ and/*en* $r = \frac{1}{4}$ $S_\infty = \frac{\frac{\sqrt{3}}{4}}{1-\frac{1}{4}}$ $= \frac{\sqrt{3}}{3}\text{units}^2$ / *eenhede*^{2}	✓ area / *oppervlakte* ✓ common ratio / *gemene verhouding* ✓ substitution/ *vervanging* ✓ answer / *antwoord* (4)

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2.3	$T_n = S_n - S_{n-1}$ $= n(n+1)(2n+3) - (n-1)n(2n+1)$ $= n\left[(n+1)(2n+3) - (n-1)(2n+1)\right]$ $= n\left(2n^2 + 5n + 3 - 2n^2 + n + 1\right)$ $= n(6n+4)$ $= 6n^2 + 4n$ $T_4 = 6(4)^2 + 4(4) = 112$ **Alternative solution/*Alternatiewe oplossing*:** $T_1 = S_1 \quad ; \quad T_2 = S_2 - S_1 \quad ; \quad T_3 = S_3 - S_2 \quad ; \quad T_4 = S_4 - S_3$ $\therefore \quad T_4 = S_4 - S_3$ $= 4(4+1)[2(4)+3] - 3(3+1)[2(3)+3]$ $= 220 - 108$ $= 112$	✓ $S_n - S_{n-1}$ ✓ simplification/ *vereenvoudiging* ✓ Substitution/ *vervanging* ✓ answer / *antwoord* ✓ $S_n - S_{n-1}$ ✓ substitution / *vervanging* ✓ simplification / *vereenvoudiging* ✓ answer / *antwoord* (4)
		[20]

QUESTION/*VRAAG 3*

3.1	**-3 ; -6 ; -11 ; -18 ; -27** **-3 ; -5 ; -7 ; -9** **-2 ; -2 ; -2** $-18; -27$	✓ -18 ; -27 (1)
3.2	$2a = -2$ $\quad 3a + b = 3$ $\quad a + b + c = 1$ $a = -1$ $\quad 3(-1) + b = -3$ $\quad -1 + 0 + c = -3$ $b = 0$ $\quad c = -2$ $\therefore \ T_n = -n^2 - 2$	✓ $2a = -2$ ✓ $3(-1) + b = -3$ ✓ $-1 + 0 + c = -3$ (3)
3.3	$-n^2 - 2 = -2603$ $n^2 - 2601 = 0$ $(n - 51)(n + 51) = 0$ $n = 51$ or / *of* $n = -51$ $\therefore n = 51$	✓ standard form / *standaardvorm* ✓ answer / *antwoord* (2)
		[6]

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QUESTION/*VRAAG 4*			
4.1	$q=-2$		✓ answer / *antwoord* (1)
4.2	$0=\frac{-2}{x+3}-2$ $2=\frac{-3}{x+3}$ $2x+6=-3$ $x=-4,5$		✓ $g(x)=0$ ✓ multiplying by $(x+3)$ *vermeningvuldig met* $(x+3)$ ✓ answer / *antwoord* (3)
4.3	$h(x)=x+3-2$ $=x+1$ **OR / *OF*** $h(x)=x+c$ $-2=-3+c$ $c=1$ $h(x)=x+1$		✓ method / *metode* ✓ answer / *antwoord* (2)
4.4	$y=-2+1=-1$ $-5=x+1$ $x=-6$ $\therefore C'(-6;-1)$		✓*y*-coordinate / *koördinaat* ✓ *x*-coordinate / *koördinaat* (2)
4.5	$p(x)=2^x$ $p^{-1}(x)=\log_2 x$		✓✓ equation of p *vergelyking van p* ✓ answer / *antwoord* (3)
4.6	4.6.1	$-4,5\le x<-3$ or/*of* $x\in[-4,5;-3)$	✓✓ answer / *antwoord* (2)
	4.6.2	$p:\quad y=2^x$ $p^{-1}:x=2^y$ $x=2$ $0<x<2$ or / *of* $x\in(0;2)$	✓ $x=2$ ✓ answer / *antwoord* (3)
			[15]

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QUESTION/*VRAAG 5*			
5.1	5.1.1	$x=\frac{1}{2}$	✓ answer / *antwoord* (1)
	5.1.2	$-6x+12=\frac{6}{x}$ $-6x^2+12x-6=0$ $x^2-2x+1=0$ $(x-1)(x-1)=0$ $x=1$ $y=-6+12=6$ or/*of* $y=\frac{6}{1}=6$ $A(1;6)$ $y=a(x+2)(x-3)$ $6=a(1+2)(1-3)$ $6=-6a$ $a=-1$ $f(x)=-(x+2)(x-3)$ $=-(x^2-3x+2x-6)$ $=-x^2+x+6$	✓ $\frac{6}{x}=-6x+12$ ✓ value of x / *waarde van x* ✓ coordinates of A or value of y *koördinate van* A *of waarde van y* ✓ $y=a(x+2)(x-3)$ ✓ value of a / *waarde van* a ✓ equation of f / *vergelyking van* f (6)
	5.1.3	$f\left(\frac{1}{2}\right)=-\left(\frac{1}{2}\right)^2+\frac{1}{2}+6$ $=6,25$	✓✓ answer / *antwoord* (2)
	5.1.4	$f(x)=-\left(x-\frac{1}{2}\right)^2+\frac{25}{4}$ $-\frac{1}{2}+m=-\frac{1}{4}$ $m=\frac{1}{4}$ $\frac{25}{4}+n=\frac{29}{4}$ $n=1$	✓ value of n / *waarde van* n ✓ value of m / *waarde van m* (2)
	5.1.5 (a)	$k>12$	✓✓ answer / *antwoord* (2)
	5.1.5 (b)	$k<\frac{25}{4}$	✓✓ answer / *antwoord* (2)

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5.2	$p(x)=ax^2+bx+c$ $p(-2)=a(-2)^2+b(-2)-4$ $-6=4a-2b-4$ $-2=4a-2b.....(1)$ $p(1)=a(1)^2+b(1)^2-4$ $0=a+b-4$ $4=a+b.....(2)$ $16=4a+4b.....(3)$ $(3)-(1):$ $18=6b$ $b=3$ $a=4-3$ $=1$ $p(x)=x^2+3x-4$ $p(10)=126$	✓ equation 1 / *vergelyking* 1 ✓ equation 2 / *vergelyking* 2 ✓ value of b / *waarde van b* ✓ value of a / *waarde van a* ✓ answer / *antwoord* (5)
		[20]
QUESTION/*VRAAG 6*		
6.1	$A=P(1+i)^n$ $85\ 000=P\left(1+\frac{12}{200}\right)^{32}$ $P=85\,000\left(1+\frac{12}{200}\right)^{-32}$ $P=13\,171,38$	✓ substitution / *vervanging* ✓ $n=32$ ✓ answer / *antwoord* (3)
6.2	$F_V=\frac{x\left[(1+i)^n-1\right]}{i}$ $=\frac{55\ 000\left[\left(1+\frac{6,75}{400}\right)^{16}-1\right]}{\frac{6,75}{400}}$ $=\text{R}1\ 000\ 646,90$ yes, R1 000 646,90 is greater than R1 million ja, R1 000 646,90 *is groter as* R1 *miljoen*	✓ $i=\frac{6,75\%}{4}$ and/*en* $n=16$ ✓ substitution / *vervanging* ✓ F_V ✓ conclusion / *gevolgtrekking* (4)

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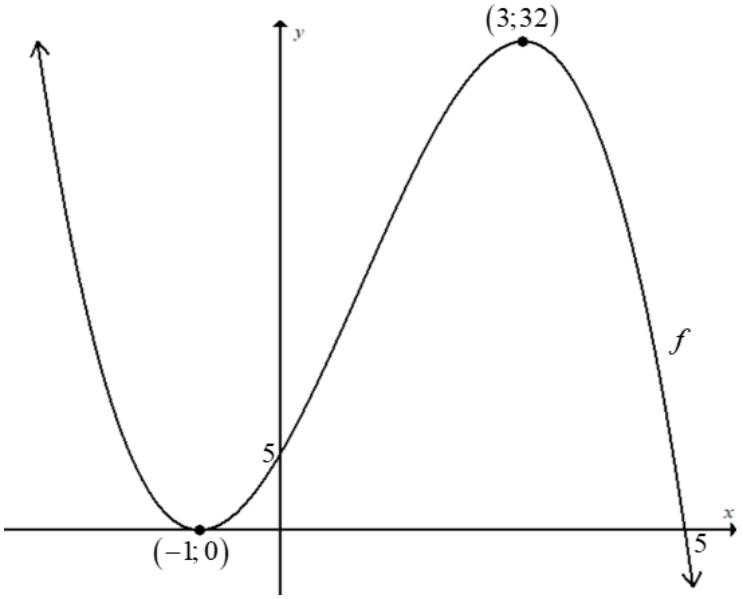
6.3	6.3.1	$P_v = \dfrac{x\left[1-(1+i)^{-n}\right]}{i}$ $750\,000\left(1+\dfrac{11,5\%}{12}\right)^5 = \dfrac{x\left[1-\left(1+\dfrac{11,5\%}{12}\right)^{-235}\right]}{\dfrac{11,5\%}{12}}$ $\therefore\ x = \dfrac{750\,000\left(1+\dfrac{11,5\%}{12}\right)^5\left(\dfrac{11,5\%}{12}\right)}{\left[1-\left(1+\dfrac{11,5\%}{12}\right)^{-235}\right]}$ $= \text{R}8\,435,36$	✓ $n = -235$ ✓ $750\,000\left(1+\dfrac{11,5\%}{12}\right)^5$ ✓ substitution / *vervanging* ✓ answer / *antwoord* (4)
	6.3.2	$Total_1 = \text{R}\,8\,435,36 \times 235$ $= \text{R}1\,982\,309,60$ $Total_2 = \text{R}\,7\,998,22 \times 240$ $= \text{R}1\,919\,572,80$ Excess amount due to deferred payment : *Oortollige bedrag as gevolg van uitgestelde bedrag* : $= \text{R}1\,982\,309,22 - \text{R}1\,919\,572,80$ $= \text{R}\,62\,736,80$	✓ R1 982 309,60 & R1 919 572,60 ✓ answer / *antwoord* (2)
			[13]

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QUESTION/*VRAAG 7*

7.1	7.1.1	$f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$ $=\lim\limits_{h\to 0}\dfrac{3(x+h)^2-1-(3x^2-1)}{h}$ $=\lim\limits_{h\to 0}\dfrac{3(x^2+2xh+h^2)-1-3x^2+1}{h}$ $=\lim\limits_{h\to 0}\dfrac{3x^2+6xh+3h^2-1-3x^2+1}{h}$ $=\lim\limits_{h\to 0}\dfrac{6xh+3h^2}{h}$ $=\lim\limits_{h\to 0}\dfrac{h(6x-3h)}{h}$ $=\lim\limits_{h\to 0}(6x-3h)$ $=6x$ Penalise 1 mark for incorrect notation in this question *Penaliseer 1 punt vir verkeerde notasie in hierdie vraag* Answer ONLY: 0 marks *SLEGS antwoord*: 0 *punte*	✓ $3x^2+6xh+3h^2$ ✓ simplification / *vereenvoudiging* ✓ factorisation / *faktorisering* (dividing by h / *deel deur* h) ✓ answer / *antwoord* (4)
	7.1.2	$m_t=f'(1)=6$ $y=6x+c$ $2=6(1)+c$ $c=-4$ $y=6x-4$	✓ $f'(1)=6$ ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)
7.2	7.2.1	$\dfrac{d}{dx}(x^2+5x)$ $=2x+5$	✓ $2x$ ✓ 5 (2)
	7.2.2	$\dfrac{y}{(1-\sqrt{x})}=\dfrac{2}{x}$ $y=\dfrac{2(1-\sqrt{x})}{x}$ $=\dfrac{2-2\sqrt{x}}{x}$ $=\dfrac{2}{x}-\dfrac{2\sqrt{x}}{x}$ $=2x^{-1}-2x^{-\frac{1}{2}}$ $\therefore \dfrac{dy}{dx}=-2x^{-2}+x^{-\frac{3}{2}}$	✓ $\dfrac{2}{x}-\dfrac{2\sqrt{x}}{x}$ ✓ $2x^{-1}-2x^{-\frac{1}{2}}$ ✓ $-2x^{-2}$ ✓ $x^{-\frac{3}{2}}$ (4)
			[13]

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QUESTION 8/*VRAAG 8*			
8.1	8.1.1	$f(x) = -x^3 + 3x^2 + 9x + 5$ $x-\text{int}, y = 0:$ $(x+1)(x+1)(x-5) = 0$ $x = -1$ or/*of* $x = 5$ $(-1;0) \quad (5;0)$	✓ first factor / *eerste faktor* ✓ other factor / *ander faktor* ✓ x-intercepts / *x-afsnitte* (3)
	8.1.2	$f(x) = -x^3 + 3x^2 + 9x + 5$ $f'(x) = -3x^2 + 6x + 9$ $f'(x) = 0$ $-3x^2 + 6x + 9 = 0$ $x^2 - 2x - 3 = 0$ $(x-3)(x+1) = 0$ $x = 3$ or / *of* $x = -1$ $f(3) = 32$ $f(-1) = 0$ $(3;32) \quad (-1;0)$	✓ $f'(x)$ ✓ $f'(x) = 0$ ✓ $x-$values / $x-$*waardes* ✓ $y-$values / $y-$*waardes* (4)
	8.1.3		✓ shape / *vorm* ✓ intercepts / *afsnitte* ✓ turning points / *draaipunte* (3)
8.2	8.2.1	$3x^2 + 6x = 0$ $x(3x+6) = 0$ $x = 0$ *or* / *of* $x = -2$ $-2 < x < 0$ **OR / *OF*** $x \in (-2\ ;\ 0)$	✓ $x = -2$ ✓ answer / *antwoord* (2)

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	8.2.2	$x = \frac{-2+0}{2}$ $x = -1$ **OR / *OF*** $6x + 6 = 0$ $6x = -6$ $x = -1$	✓ method / *metode* ✓ answer / *antwoord* (2)
	8.2.3	$-2 \le x \le -1 \quad or / of \quad x \ge 0$	✓✓ $-2 \le x \le -1$ ✓ $x \ge 0$ (3)
			[17]

QUESTION/*VRAAG 9*

	$8x + 4h = 3$ $4h = 3 - 8x$ $h = \frac{3}{4} - 2x$ $V = x^2 h$ $= x^2\left(\frac{3}{4} - 2x\right)$ $= \frac{3}{4}x^2 - 2x^3$ $V'(x) = \frac{3}{2}x - 6x^2 = 0$ $x\left(\frac{3}{2} - 6x\right) = 0$ $x = 0 \quad or / of \quad -6x = -\frac{3}{2}$ $x = \frac{1}{4}$ $\therefore\ h = \frac{3}{4} - 2\left(\frac{1}{4}\right) = \frac{1}{4}$	✓ $8x + 4h = 3$ ✓ h in terms of x / *h in terme van x* ✓ substitution / *vervanging* ✓ answer / *antwoord* ✓ $V'(x) = 0$ ✓ x-values / *x-waardes* ✓ value of h / *waarde van h* (7)
		[7]

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QUESTION 10/*VRAAG 10*			
10.1	10.1.1	$\text{P(A and/}en\text{ B)} = \text{P(A)} + \text{P(B)} - \text{P(A or/}of\text{ B)}$ $= 0,3 + 0,5 - 0,65$ $= 0,15$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
	10.1.2	$\text{P(A and/}en\text{ B)} = 0,15$ $\text{P(A)} \times \text{P(B)} = 0,3 \times 0,5$ $= 0,15$ $\therefore \text{P(A and/}en\text{ B)} = \text{P(A)} \times \text{P(B)} = 0,15$ $\therefore$ Events are independent / *Gebeurtenisse is onafhanklik*	✓✓ $P(A) \times P(B) = 0,15$ ✓ conclusion / *gevolgtrekking* (3)
10.2	10.2.1	$a = 35$ and/*en* $b = 15$	✓ *a* ✓ *b* (2)
	10.2.2	$\frac{11}{45}$ $\approx 0,24$	✓✓ answer / *antwoord* (2)
			[9]
QUESTION/*VRAAG 11*			
11.1	$4! \times 8!$ ways / *maniere* $= 967\,680$ ways / *maniere*		✓✓ answer / *antwoord* (2)
11.2	$P(E) = \frac{4! \times 3!}{12!}$ $= \frac{1}{3326400}$		✓ 4! x 3! ✓ 12! ✓ answer / *antwoord* (3)
			[5]
		TOTAL/*TOTAAL*:	**150**

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education

Department of Education
FREE STATE PROVINCE

PREPARATORY EXAMINATION/ *VOORBEREIDENDE EKSAMEN*

GRADE/*GRAAD* 12

MATHEMATICS P1/*WISKUNDE V1*

SEPTEMBER 2026

MARKS/*PUNTE*: 150

MARKING GUIDELINES/*NASIENRIGLYNE*

These marking guidelines consist of 17 pages./
Hierdie nasienriglyne bestaan uit 17 bladsye.

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NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt at a question and not redone the question, mark the crossed-out version.
- Consistent accuracy applies in ALL aspects of the marking memorandum. Stop marking the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

NOTA:

- *As 'n kandidaat 'n vraag TWEE KEER beantwoord, merk slegs die EERSTE poging.*
- *As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, merk die doodgetrekte poging.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die nasienriglyne toegepas. Hou op nasien by die tweede berekeningsfout.*
- *Aanvaar van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat nie.*

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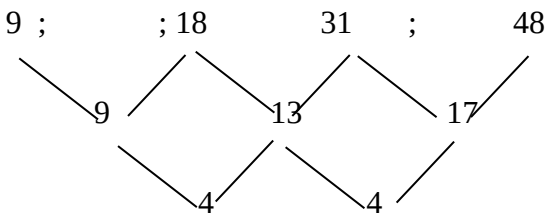
QUESTION/*VRAAG* 1

1.1.1	$(x+2)(x-2)=5$ $\therefore x^2-4=5$ $\therefore x^2=9$ $\therefore x=\pm 3$	✓ x^2-4 ✓Answer (2)
1.1.2	$\frac{1}{2}x^2-2x-1=0$ **Method 1** $\frac{1}{2}x^2-2x-1=0$ $x=\frac{-(-2)\pm\sqrt{(-2)^2-4\left(\frac{1}{2}\right)(-1)}}{2\left(\frac{1}{2}\right)}=2\pm\sqrt{6}$ $\therefore x=4,45 \quad \text{or} \quad x=-0,45$ **Method 2** $\frac{1}{2}x^2-2x-1=0$ $\therefore x^2-4x-2=0$ $x=\frac{-(-4)\pm\sqrt{(-4)^2-4(1)(-2)}}{2(1)}=\frac{4\pm\sqrt{24}}{2}$ $\therefore x=4,45 \quad \text{or} \quad x=-0,45$	✓ substitution into the correct formula ✓ Answer ✓ Answer (3) ✓ substitution into the correct formula ✓ Answer ✓ Answer (3)

1.1.3	$5 < x(7-2x)$ $2x^2 - 7x + 5 < 0$ $(2x-5)(x-1) < 0$ C/V: 1 & $\frac{5}{2}$ $1 < x < \frac{5}{2}$ But since $x > 2$ $\therefore 2 < x < \frac{5}{2}$	✓ Standard form ✓Factors ✓ C/V ✓interval for x values ✓Conclusion (5)
1.1.4	$3^x - 1 = \sqrt{2.3^{x+1} + 10}$ $(3^x - 1)^2 = 2.3^{x+1} + 10$ $3^{2x} - 2.3^x + 1 - 2.3^x.3^1 - 10 = 0$ $3^{2x} - 8.3^x - 9 = 0$ $(3^x - 9)(3^x + 1) = 0$ $3^x = 9$ or $3^x = -1$ $\therefore 3^x = 3^2$ $\therefore x = 2$	✓ squaring both sides ✓ standard form ✓ factors ✓answer (4)
1.2.1	For real and equal roots $\Delta = 0$ $\therefore p^2 - 2p + 1 = 0$ $(p-1)(p-1) = 0$ $\therefore p = 1$	✓ $p^2 - 2p + 1 = 0$ ✓ $p = 1$ (2)
1.2.2	$x = 2 \pm \sqrt{1^2 - 2(1) + 1}$ $\therefore x = 2$ $\therefore (x-2)(x-2) = 0$ $\therefore x^2 - 4x + 4 = 0$ $\therefore b = -4$ $\therefore c = 4$	✓ $x = 2$ ✓ $(x-2)(x-2) = 0$ ✓ $b = -4$ both values $c = 4$ (3)

1.3	$\frac{2^{2y}}{2^x} = 2^{-1}$ $2^{2y-x} = 2^{-1}$ $\therefore x = 2y+1$ $x^2 + y^2 = 29$ $(2y+1)^2 + y^2 - 29 = 0$ $5y^2 + 4y - 28 = 0$ $(y-2)(5y+14) = 0$ $\therefore y = 2$ or $y = -\frac{14}{5}$ $x = 5$ or $x = -\frac{23}{5}$	✓ $2^{2y-x} = 2^{-1}$ ✓ $x = 2y+1$ ✓substitution ✓standard form ✓ factors ✓y values ✓x values (7)
		[26]

QUESTION/*VRAAG* 2

2.1.1	 $2a = 4$ $\therefore a = 2$ $3a + b = 9$ $3(2) + b = 9$ $\therefore b = 3$ $a + b + c = 9$ $2 + 3 + c = 9$ $\therefore c = 4$ $\therefore T_n = 2n^2 + 3n + 4$	✓ $a = 2$ ✓ $b = 3$ ✓ $c = 4$ ✓ $T_n = 2n^2 + 3n + 4$ (4)
2.1.2	$2n^2 + 3n + 4 = 864$ $2n^2 + 3n - 860 = 0$ $(n - 20)(2n + 43) = 0$ $\therefore n = 20$	✓ $2n^2 + 3n + 4 = 864$ ✓ $(n - 20)(2n + 43) = 0$ ✓ $n = 20$ (3)
2.2	$T_3 - T_2 = 10$ $T_3 - 14 = 10$ $\therefore T_3 = 24$ $T_4 = 7p$ $\therefore 10 - 14 + p = 7p - 24 - 10$ $-6p = -30$ $\therefore p = 5$	✓ $T_3 - 14 = 10$ ✓ $T_3 = 24$ ✓ $10 - 14 + p = 7p - 24 - 10$ ✓ $p = 5$ (4)
		[11]

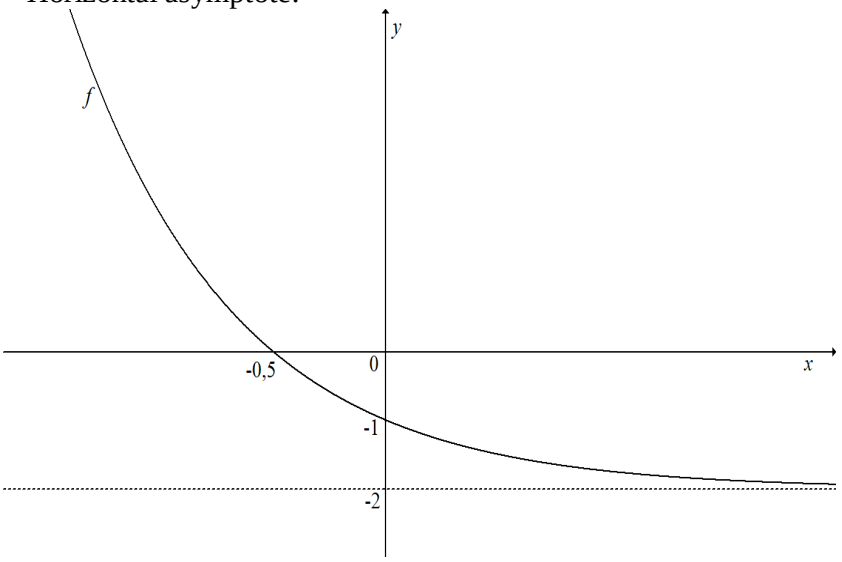
QUESTION/*VRAAG* 3

3.1.1	$T_4 = 55$ $T_{10} = 45$ $a + 3d = 55$ $\underline{a + 9d = 45}$ $-6d = 10$ $\therefore d = -\frac{5}{3}$ $\therefore a + 3\left(-\frac{5}{3}\right) = 55$ $\therefore a = 60$	✓Setting up the two equations ✓ $d = -\frac{5}{3}$ ✓ $a = 60$ (3)
3.1.2	60; $\frac{175}{3}$; $\frac{170}{3}$; ...; 0; $-\frac{5}{3}$; ... $0 = 60 + (n-1)\left(-\frac{5}{3}\right)$ $\therefore n = 37$ $\therefore S_n = \frac{n}{2}[a + l]$ $S_{37} = \frac{37}{2}[60 + 0]$ $= 1110$	✓Setting up the sequence/series ✓The value of n ✓Substitution into the correct sum formula ✓Answer (4)
3.2	$a; b; ...$ $r = \frac{b}{a}$ $\therefore T_3 = b \times \frac{b}{a}$ $\therefore T_3 = \frac{b^2}{a}$	✓ $T_3 = \frac{b^2}{a}$ (1)

3.3.1	$\sum 3.n^{1-r} = 3 + \frac{3}{n} + \frac{3}{n^2} + ... = 6$ $S_\infty = \frac{a}{1-r}$ $6 = \frac{3}{1-\frac{1}{n}}$ $6 - \frac{6}{n} = 3$ $3n = 6$ $\therefore n = 2$	✓Expansion ✓Substitution into the correct formula ✓Answer (3)
3.3.2	$S_n = \frac{a\left(r^n - 1\right)}{r-1}$ $S_{10} = \frac{3\left[\left(\frac{1}{2}\right)^{10} - 1\right]}{\frac{1}{2} - 1}$ $= 5{,}99$	✓Substitution into the correct formula ✓Answer (2)
		[13]

QUESTION/*VRAAG* 4

4.1.1	$f'(x)=2x-14$ $f'(8)=2$ $f(8)=-5$ $y=2x+c$ subst $(8;-5)$ $-5=2(8)+c$ $\therefore c=-21$ $\therefore y=2x-21$ or $y+5=2(x-8)$ $y+5=2x-16$ $\therefore y=2x-21$	✓ $2x-14$ ✓gradient at $x=8$ ✓y value ✓substitution ✓answer (5)
4.1.2	$g'(x)=-2x+10$ $-2x+10=2$ $\therefore x=4$ $y=2(4)-21$ $=-13$ $\therefore \text{B}(4;-13)$ $g(x)=-x^2+10x-19+k$ subst $\text{B}(4;-13)$ $-13=-(4)^2+10(4)-19+k$ $k=-18$	✓ $-2x+10=2$ ✓the value of x ✓ $\text{B}(4;-13)$ ✓substitution of $\text{B}(4;-13)$ ✓value of k (5)

4.2.1	$f(x)=4^{-x}-2$ y- intercept: $y=4^{-(0)}-2=-1$ x- intercept: $0=4^{-x}-2$ $\therefore 2=2^{-2x}$ $\therefore 1=-2x$ $\therefore x=-\frac{1}{2}$ $y=-2$ Horizontal asymptote:  	✓Shape ✓x-intercept on the graph ✓ y-intercept on the graph ✓asymptote (4)
4.2.2	$\frac{1}{2}$ units to the right and 2 units upwards.	✓✓$\frac{1}{2}$ units to the right ✓2 units upwards (3)
4.2.3	$h(x)=\left(\frac{1}{4}\right)^x$ $x=\left(\frac{1}{4}\right)^y$ $y=\log_{\left(\frac{1}{4}\right)}(x)$ $h^{-1}(x)=\log_{\left(\frac{1}{4}\right)}(x)$	✓Swop x and y ✓answer (2)
4.2.4	$y>-2$	✓✓ $y>-2$ (2)
		[21]

QUESTION/*VRAAG* 5

5.1	$g(x)=\frac{a}{x+1}+1$ Substitute the point $(-2;2)$: $2=\frac{a}{-2+1}+1$ $\therefore 1=\frac{a}{-1}$ $\therefore a=-1$ $y=\frac{-1}{x+1}+1$ $\therefore p=1,\ q=1,\ a=-1$ $y=dx^2$ Substitute the point $(-2;2)$: $2=d(-2)^2$ $\therefore d=\frac{1}{2}$ $\therefore y=\frac{1}{2}x^2$	✓ $a=-1$ ✓ $p=1$ ✓ $q=1$ ✓ $d=\frac{1}{2}$ (4)
5.2	$\frac{1}{2}x^2=\frac{-1}{x+1}+1$ $\frac{1}{2}x^2(x+1)=-1+x+1$ $x^3+x^2-2x=0$ $x(x^2+x-2)=0$ $x(x+2)(x-1)=0$ $\therefore x=0$ or $x=-2$ or $x=1$ $\therefore y=\frac{1}{2}(1)=\frac{1}{2}$ $\therefore \text{Q}\left(1;\frac{1}{2}\right)$	✓$\frac{1}{2}x^2=\frac{-1}{x+1}+1$ ✓Standard form ✓Factors ✓Values of x ✓Coordinates of Q (5)
5.3	$\text{BC}=\frac{1}{2}x^2-\left(-\frac{1}{x+1}+1\right)$ $=\frac{1}{2}(4)^2+\frac{1}{4+1}-1$ $=7.2$ units	✓The difference between the two functions ✓Substituting the value 4 ✓Answer (3)
		[12]

QUESTION/*VRAAG* 6

6.1	$100000 = 230000(1-0,07)^n$ $n = \log_{0,93} 0,4347826087$ $n = 11,47721057$ It will take approximately 11 years 6 months to depreciate to R100 1000	✓Substitution into the correct formula ✓use of log ✓answer (3)
6.2.1	$350000 = \dfrac{x\left[\left(1+\dfrac{0,14}{12}\right)^{97}-1\right]}{\dfrac{0.14}{12}}$ $x = R1962.60$	✓n = 97 ✓ $i = \dfrac{0,14}{12}$ ✓ subst ✓answer (4)
6.2.2	$A = 350000 + 15000\left(1+\dfrac{0,14}{12}\right)^{84} - 20000\left(1+\dfrac{0.14}{12}\right)^{72}$ $A = R343638,14$ $shortfall = 350000 - 343638,14$ $= R6361,86$	✓$15000\left(1+\dfrac{0,14}{12}\right)^{84}$ ✓$20000\left(1+\dfrac{0.14}{12}\right)^{72}$ ✓ $R343\ 638,14$ ✓ $R6\ 361,86$ (4)
6.3	decrease $P_x \times (1-0,08)^3$ increase $P_Y \times (1+0.12)^3$ $\dfrac{P_x}{P_y} = \dfrac{(1-0,08)^3}{(1+0,12)^3}$ $\dfrac{P_x}{P_y} = \dfrac{0,554254736}{1}$	✓ $P_x \times (1-0,08)^3$ ✓ $P_Y \times (1+0.12)^3$ ✓ $\dfrac{P_x}{P_y} = \dfrac{(1-0,08)^3}{(1+0,12)^3}$ ✓ $\dfrac{0,554254736}{1}$ (4)
		[15]

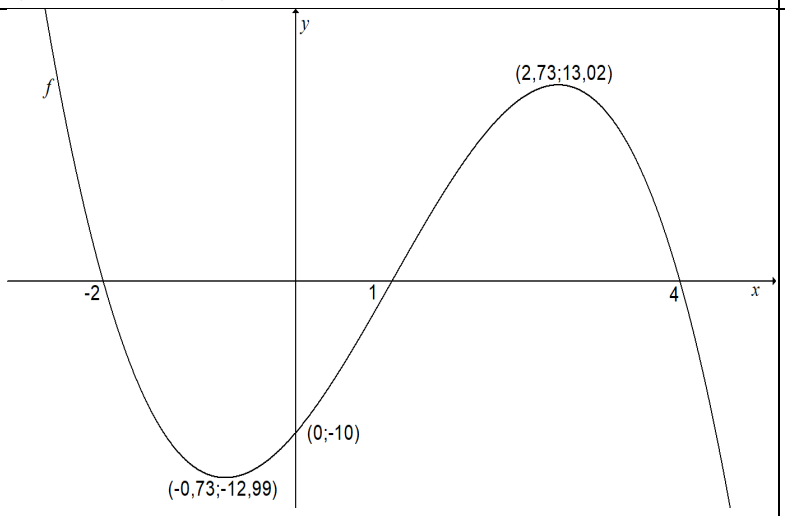
QUESTION/*VRAAG* 7

7.1	$f(x)=-x^2-3$ $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $f'(x)=\lim_{h\to 0}\frac{-(x+h)^2-3-(-x^2-3)}{h}$ $f'(x)=\lim_{h\to 0}\frac{-x^2-2xh-h^2-3+x^2+3}{h}$ $f'(x)=\lim_{h\to 0}\frac{-2xh-h^2}{h}$ $f'(x)=\lim_{h\to 0}\frac{h(-2x-h)}{h}$ $f'(x)=\lim_{h\to 0}(-2x-h)$ $f'(x)=-2x$	✓ Substitution ✓ Simplification ✓ Factors ✓ answer (4)
7.2.1	$D_x\left[\frac{8x^2-14x-15}{4x+3}\right]$ $=D_x\left[\frac{(4x+3)(2x-5)}{4x+3}\right]$ $=D_x[2x-5]$ $=2$	✓ Factors ✓ Simplification ✓ answer (3)
7.2.2	$\frac{\sqrt[4]{x^{-5}}}{x^{-3}}-\frac{\sqrt[3]{x^2}}{2x^2}+3x^2$ $=\frac{x^{\frac{-5}{4}}}{x^{-3}}-\frac{x^{\frac{2}{3}}}{2x^2}+3x^2$ $=x^{\frac{7}{4}}-\frac{1}{2}x^{\frac{-4}{3}}+3x^2$ $=\frac{7}{4}x^{\frac{3}{4}}+\frac{2}{3}x^{\frac{-7}{4}}+6x$	✓ $x^{\frac{-5}{4}}$ ✓ $x^{\frac{2}{3}}$ ✓ $x^{\frac{7}{4}}$ ✓ $-\frac{1}{2}x^{\frac{-4}{3}}$ ✓First two ✓The last one (6)

7.3	$f'(x) = -9x^2 - 4$ $f'(-1) = -9(-1)^2 - 4$ $\therefore m = -13$ $f(-1) = -3(-1)^3 - 4(-1) + 5$ $= 12$ $(-1;12)$ $y - y_1 = m(x - x_1)$ $y - 12 = -13(x + 1)$ $y = -13x - 1$	✓ Gradient ✓ y value ✓ Substitution ✓ answer (4)
		[17]

QUESTION/*VRAAG* 8

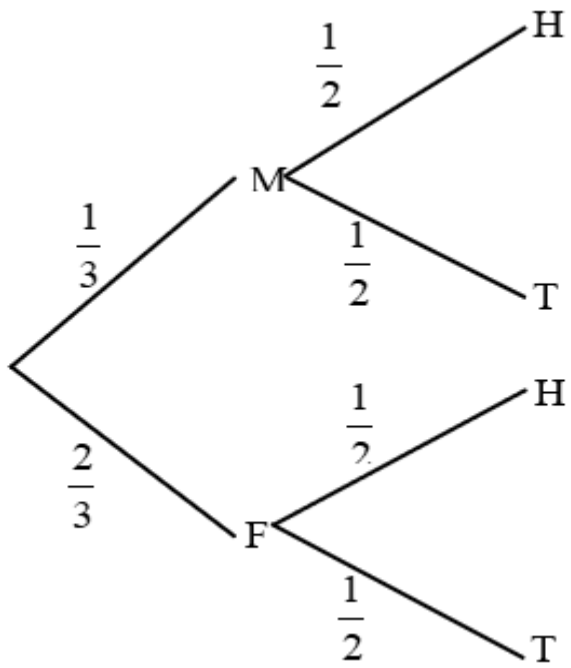
8.1	$f(x) = a(x - x_1)(x - x_2)(x - x_3)$ $f(x) = a(x + 2)(x - 1)(x - 4)$ $10 = a(2 + 2)(2 - 1)(2 - 4)$ $\therefore -8a = 10$ $\therefore a = \frac{-5}{4}$ $f(x) = -\frac{5}{4}(x + 2)(x^2 - 5x + 4)$ $f(x) = -\frac{5}{4}(x^3 - 3x^2 - 6x + 8)$ $f(x) = -\frac{5}{4}x^3 + \frac{15}{4}x^2 + \frac{15}{2}x - 10$	✓Substitution of x-intercepts and the point (2 ; 10) ✓The value of a ✓Substituting a in the formula ✓answer (4)

8.2	$f(x)=-\frac{5}{4}x^3+\frac{15}{4}x^2+\frac{15}{2}x-10$ $f'(x)=-\frac{15}{4}x^2+\frac{30}{4}x+\frac{15}{2}$ $0=-15x^2+30x+30$ $x^2-2x-2=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $x=\frac{2\pm\sqrt{12}}{2}$ $x=-0.73$ $x=2.73$ $(2,73;\ 13,02)$ $(-0,73;\ -12,99)$	✓Equating the derivative to zero ✓Subst. into the quadratic formula ✓Values of x ✓Values of y (4)
8.3		✓shape ✓*x*-intercepts ✓*y*-intercept ✓turning points (4)
		[12]

QUESTION/*VRAAG* 9

9.1	A maximum turning point is the value of y where the graph of the function changes from increasing to decreasing, and the profit is at its highest.	(1)
9.2	$-4x+160=0$ $x=40$	✓Derivative equated to zero ✓The value of x (2)
9.3	$p(40)=-2(40)^2+160(40)-2000$ $p(40)=R1200$	✓Substitution ✓Answer (2)
9.4	$p(60)=-2(60)^2+160(60)-2000$ $p(60)=R400$ The company should not operate at full capacity, but rather produce 40 units for maximum profit	✓Substitution ✓Answer ✓Conclusion (3)
		[8]

QUESTION/*VRAAG* 10

10.1.1	P (not A) = 1 – 0,35 = 0.65	✓Substitution ✓Answer (2)
10.1.2	P (A and B) = 0	✓Answer (1)
10.1.3	P (A or B) = 0,35 + 0.52 – 0 = 0,87	✓Substitution ✓Answer (2)
10.2.1		✓Event A ✓Event B: Male ✓Event B: Female (3)
10.2.2	$P(F)=\left(\frac{2}{3}\times\frac{1}{2}\right)+\left(\frac{2}{3}\times\frac{1}{2}\right)$ $=\frac{2}{3}$	✓Answer (1)
10.2.3	*P (Male flipping Head)* $=\frac{1}{3}\times\frac{1}{2}=\frac{1}{6}$	✓Substitution ✓Answer (2)
10.3	Two letters and one digit: 5 × 5 × 10 = 250 Two letters and two digits: 5 × 5 × 10 × 9 = 2 250 Two letters and three digits: 5 × 5 × 10 × 9 × 8 = 18 000 Two letters and four digits: 5 × 5 × 10 × 9 × 8 × 7 = 126 000 ∴ Codes of two letters and four digits will ensure unique codes for 120 000 members	✓First and second statements ✓Third statement ✓Fourth statement ✓conclusion (4)
		[15]

TOTAL/*TOTAAL*: 150

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GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION

2026

MARKING GUIDELINES

MATHEMATICS PAPER 1 (10611)

22 pages

NOTES:

- If a candidate answered a question TWICE, mark only the *FIRST* attempt.
- If a candidate crossed OUT an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy (CA) applies to ALL aspects of the marking guidelines.
- It is UNACCEPTABLE for candidates to assume values/answers in order to solve a question.
- (A) – denotes an accuracy mark.

QUESTION 1

1.1.1	$3x^2 - x + 2 = x + 2$ $3x^2 - 2x = 0$ $x(3x - 2) = 0$ $x = 0 \quad \text{or} \quad x = \frac{2}{3}$	✓ standard form ✓ factors ✓ both answers	(3)
1.1.2	$7x^2 - x - 2 = 0$ $x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(7)(-2)}}{2(7)}$ $x = 0,61 \quad \text{or} \quad x = -0,47$ **NOTE: Penalise one mark for incorrect rounding in this question.**	✓ correct substitution ✓ answer ✓ answer	(3)
1.1.3	$\left(\frac{x}{2}\right)^2 - 5x + 24 \leq 0$ $\frac{x^2}{4} - 5x \leq -24$ $x^2 - 20x + 96 \leq 0$ $(x - 8)(x - 12) \leq 0$ CVs = 8 ; 12  $8 \leq x \leq 12$	✓ squaring fraction ✓ standard form ✓ critical values ✓✓ answer (combo mark)	(5)
1.1.4	$2^{-x+2} - 2^{-x} = 48$ $2^{-x}(2^2 - 1) = 48$ $2^{-x} = 16$ $2^{-x} = 2^4$ $x = -4$ **OR** *let* $2^{-x} = k$ $\therefore 4k - k = 48$ $3k = 48$ $k = 16$ $\therefore 2^{-x} = 16$ $2^{-x} = 2^4$ $x = -4$	✓ factorise HCF ✓ simplify (equate = bases) ✓ answer for x ✓ setting up eqn with k ✓ simplify (equate = bases) ✓ answer for x	(3)

1.2	$\sqrt{2x+1}-2=y \qquad x=4y...(1)$ $2x+1=(y+2)^2$ $2x+1=y^2+4y+4$ ...(2) sub (1) into (2) $2(4y)+1=y^2+4y+4$ $8y+1=\ y^2+4y+4$ $0=\ y^2-4y+3$ $0=(y-3)(y-1)$ $y=3 \quad \text{or} \quad y=1$ $x=12 \quad \text{or} \quad x=4$ **OR** $\sqrt{2x+1}-2=y...(1) \qquad x=4y...(2)$ sub (2) into (1) $\sqrt{2(4y)+1}-2=y$ $\sqrt{8y+1}=y+2$ $8y+1=y^2+4y+4$ $0=y^2-4y+3$ $0=(y-3)(y-1)$ $y=3 \quad \text{or} \quad y=1$ $x=12 \quad \text{or} \quad x=4$	✓ isolate surd ✓ square ✓ substitution ✓ standard form ✓ both *y*-values ✓ both *x*-values ✓ substitution ✓ isolate surd ✓ square ✓ standard form ✓ both y-values ✓ both x-values	(6)
1.3.1	$b=-5$ $-4ac=56a$ $c=-14$ $0=ax^2-5x-14$ $0=(x-7)(ax+2)$ $0=ax^2-7ax+2x-14$ $-7ax=-7x$ $\therefore a=1$ **OR**	✓ $b=-5$ ✓ setting up equation ✓ value for *c* ✓ setting up equation ✓ value for *a*	

	$b=-5$ $-4ac=56a$ $c=-14$ $\frac{5+\sqrt{25+56a}}{2a}=7$ $5+\sqrt{25+56a}=14a$ $\sqrt{25+56a}=14a-5$ $25+56a=196a^2-140a+25$ $196a^2-196a=0$ $196a(a-1)=0$ $a\neq 0$ or $a=1$ **OR** $ax^2+bx+c=0$ $49a+7b+c=0...(1)$ $x=\frac{5-\sqrt{25+56a}}{2a}$ $-b=5$ $b=-5$ $b^2-4ac=25+56a$ $(5)^2-4ac=25+56a$ $-4ac=56a$ $c=-14$ from (1) $49a-49=0$ $a=1$ **OR** $b=-5$ $-4ac=56a$ $c=-14$ $0=a(7)^2-5(7)-14$ $49a-35-14=0$ $\therefore a=1$	✓ $b=-5$ ✓ setting up equation ✓ value for c ✓ substitution ✓ value for a ✓ setting up equation ✓ value for b ✓ substitution ✓ value for c ✓ value for a ✓ $b=-5$ ✓ setting up equation ✓ value for c ✓ substitution ✓ value for a	(5)
1.3.2	$x=-2$	✓ answer	(1)
			[26]

QUESTION 2

2.1	$7\sin 30°\ ;\ 7\ ;\ 23\sin 30°\ ;\ 17...$ $\frac{7}{2}\ ;\ 7\ ;\ \frac{23}{2}\ ;\ 17$ $\frac{7}{2}\quad\frac{9}{2}\quad\frac{11}{2}$ $1\quad 1$ 2^{nd} Difference $= 1$ $\therefore$ the pattern is quadratic	✓ sequence ✓ first differences ✓ 2nd differences	(3)
2.2	$3a+b=\frac{7}{2}$ $3\left(\frac{1}{2}\right)+b=\frac{7}{2}$ $b=2$ $\therefore p=2$ $a+b+c=\frac{7}{2}$ $\frac{1}{2}+2+c=\frac{7}{2}$ $c=1$ $\therefore q=1$ **NOTE: Award FULL marks if left in terms of *b* and *c*.** **Answer only, award ZERO marks.**	✓ substitution ✓ substitution	(2)
2.3	$49=\frac{1}{2}n^2+2n+1$ $0=n^2+4n-96$ $0=(n+12)(n-8)$ $n\neq -12$ or $n=8$	✓ equate to 49 ✓ standard form ✓ factors ✓ both answers with rejection.	(4)

2.4	$x = \frac{-2}{2\left(\frac{1}{2}\right)}$ $x = -2$ The minimum value of the function occurs where, $x = -2,$ but $n \neq -2$ as $n \in N$.	✓ $x = \frac{-b}{2a}$ calculation ✓ value for x ✓ valid explanation.	
	OR $y = \frac{1}{2}x^2 + 2x + 1$ $\frac{dy}{dx} = x + 2$ $0 = x + 2$ $x = -2$ The minimum value of the function occurs where, $x = -2,$ but $n \neq -2$ as $n \in N$.	✓ derivative=0 ✓ value for x ✓ valid explanation.	
	OR A valid explanation as follows: The learner is incorrect because Tn represents a number pattern, and n can therefore only be positive integers. The turning point of the quadratic function gives the minimum value of the function for all real values of x, but not necessarily the minimum term of the pattern. Since the sequence increases from n=1, the minimum term of the pattern is: $T_1 = \frac{1}{2}(1)^2 + 2(1) + 1$ $T_1 = \frac{7}{2}$ The turning point of the function can therefore not be used to determine the minimum value of the pattern as it occurs at an impermissible value of n. **NOTE: The explanation must be supported by a valid calculation of the turning point of the associated quadratic function or of the first term of the pattern.** **In the second option, the = 0 for the first mark may be implied.**	✓ valid explanation ✓ calculation for T_1 ✓ valid explanation	(3)
			[12]

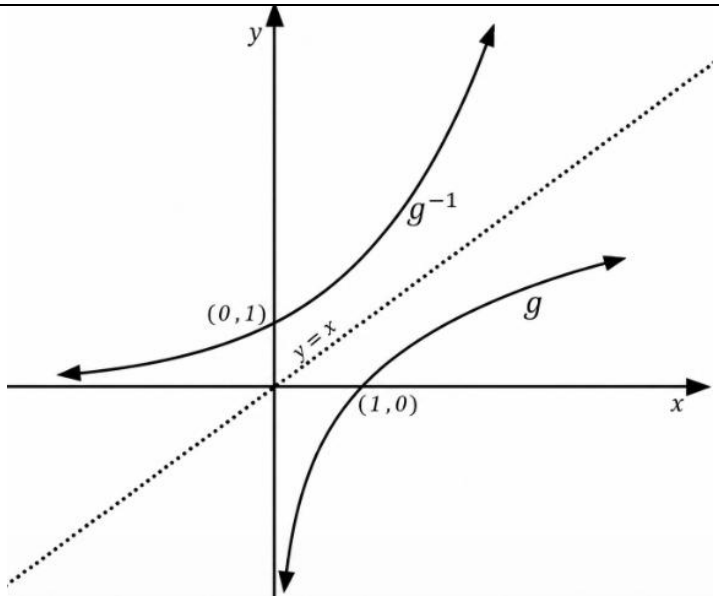
QUESTION 3

3.1.1	$r=\frac{2}{3}x\ ;\quad x\neq 0$ $-1<r<1$ $-1<\frac{2}{3}x<1$ $\therefore -\frac{3}{2}<x<\frac{3}{2}$ **NOTE:** $x\neq 0$ **may be implied.**	✓ $r=\frac{2}{3}x$ ✓ answer	(2)
3.1.2	$3\ +\ 1\ +\ \frac{1}{3}$ $r=\frac{1}{3}$ $S_\infty=\frac{3}{1-\frac{1}{3}}$ $S_\infty=\frac{9}{2}$ **OR** $S_\infty=\frac{3}{1-\frac{2}{3}\left(\frac{1}{2}\right)}$ $S_\infty=\frac{9}{2}$	✓ value for r ✓ substitution ✓ answer ✓✓ substitution ✓ answer	(3)

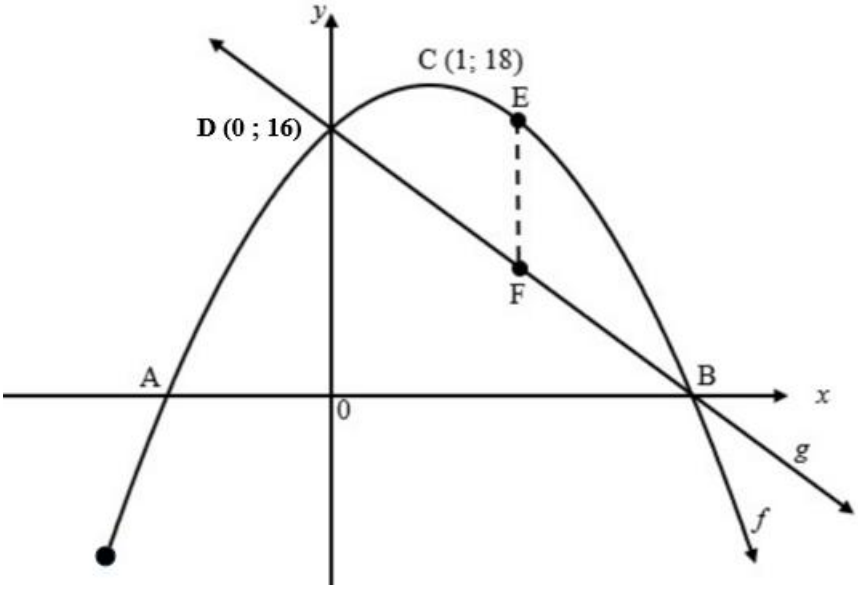
3.2.1	$B_n = \sum_{k=1}^{n} 24\left(\frac{3}{2}\right)^k$ $36\ ;\ 54\ ;\ 81$ $a = 36 \qquad r = \frac{3}{2}$ $Sn = \frac{36\left[\left(\frac{3}{2}\right)^n - 1\right]}{\frac{3}{2} - 1}$ $Sn = 72\left[\left(\frac{3}{2}\right)^n - 1\right]$ **NOTE:** answer only, 0 marks	✓ values for a and r ✓ substitution	(2)
3.2.2	$A_{18} - B_n = \frac{423}{8}$ $A: -15\ ;\ -8\ ;\ -1$ $a = -15 \qquad d = 7$ $S_{18} = \frac{18}{2}[2(-15) + (18-1)(7)]$ $S_{18} = 801$ $\therefore 801 - \left[72\left(\frac{3}{2}\right)^n - 1\right] = \frac{423}{8}$ $\left(\frac{3}{2}\right)^n = \frac{729}{64}$ $\left(\frac{3}{2}\right)^n = \left(\frac{3}{2}\right)^6$ $n = 6$	✓ values for a and d ✓ substitution ✓ answer ✓ substitution ✓ simplification ✓ answer	(6)
			[13]

QUESTION 4

4.1	$p = -2$ $q = 3$ **NOTE: Answers may NOT be given in terms of *x* and *y*.**	✓ value for p ✓ value for q	(2)
4.2	$y = x + t$ substitute in $(2\,;3)$ $3 = 2 + t$ $t = 1$ **OR** Axis of symmetry with + gradient $y = x - 2 + 3$ $y = x + 1$ $t = 1$ **NOTE: Answer only, award FULL marks**	✓ substitution into equation ✓ value for t ✓ substitution into equation ✓ value for t	(2)
4.3	$y = \frac{-2}{x-2} + 3$ $h(x) = \frac{-2}{x} + 6$ $\therefore x - 6 = \frac{-2}{y}$ $y = \frac{-2}{x-6}$	✓ $\frac{-2}{x}$ ✓ +6 ✓ equation of h	(3)

4.4.1	$g(x) = \log_2 x$ $y = \log_2 x$ $\therefore x = \log_2 y$ $\therefore y = 2^x$ **NOTE: Answer only, award FULL marks.**	✓ interchange of x and y ✓ answer	(2)
4.4.2		✓ increasing g with asymptote x=0 ✓ y-intercept of g^{-1} and x intercept of g ✓ increasing g^{-1} with asymptote $y = 0$ ✓ any additional point on both graphs	(4)
4.4.3	$0 < x \leq 1$ **OR** $x \in (0;1]$	✓✓ answer (combination mark)	(2)
			[15]

QUESTION 5



5.1	$f(x) = a(x-1)^2 + 18$ $\therefore 16 = a(0-1)^2 + 18$ $16 = a + 18$ $a = -2$ $\therefore f(x) = -2(x-1)^2 + 18$ $\therefore f(x) = -2(x^2 - 2x + 1) + 18$ $\therefore f(x) = -2x^2 + 4x - 2 + 18$ $\therefore f(x) = -2x^2 + 4x + 16$	✓ subs (1;18) ✓ subs (0;16) ✓ value for a ✓ simplification of squaring binomial	(4)
5.2	$f(x) = -2x^2 + 4x + 16$ $0 = x^2 - 2x - 8$ $0 = (x+2)(x-4)$ $x = -2$ or $x = 4$ $\therefore \ AB = 6$ units	✓ $f(x) = 0$ ✓ answer	(2)

5.3	$m = \frac{16-0}{0-4}$ $m = -4$ $\therefore g(x) = -4x + 16$ **OR** $y = mx + 16$ $0 = 4m + 16$ $m = -4$ $\therefore g(x) = -4x + 16$	✓ gradient ✓ answer ✓ gradient ✓ answer	(2)
5.4.1	$-4 \le x < 1$ **OR** $x \in [-4;1)$ **Accept** $-4 \le x \le 1$ or $x \in [-4;1]$	✓✓ answer	(2)
5.4.2	$1 < x < 4$ or $-4 \le x < -2$ **OR** $x \in (1;4)$ or $[-4;-2)$	✓ $1 < x < 4$ ✓ $-4 \le x < -2$	(2)

5.5	$f(x)-g(x)$ $=-2x^2+4x+16-(-4x+16)$ $=-2x^2+8x$ $\therefore EF_{MAX}$ Derivative=0 $-4x+8=0$ $4x=8$ $x=2$ $\therefore -2(2)^2+8(2)$ $=8$ units **OR** $f(x)-g(x)$ $=-2x^2+4x+16-(-4x+16)$ $=-2x^2+8x$ $x=\frac{-b}{2a}=\frac{-8}{2(-2)}$ $x=2$ $\therefore -2(2)^2+8(2)$ $=8$ units **OR** $f(x)-g(x)$ $=-2x^2+4x+16-(-4x+16)$ $=-2x^2+8x$ $\therefore -2(x^2-4x+2^2-2^2)$ $=-2(x-2)^2+2(2)^2$ $=-2(x-2)^2+8$ $\therefore 8$ units	✓ EF = $f(x)$-$g(x)$ ✓ answer in terms of x ✓ derivative = 0 ✓ value for x ✓ answer ✓ EF = $f(x)$–$g(x)$ ✓ answer in terms of x ✓ subs into $\frac{-b}{2a}$ ✓ value for x ✓ answer ✓ EF = $f(x)$-$g(x)$ ✓ answer in terms of x ✓ complete square ✓ simplify expression ✓ answer	(5)

[17]

QUESTION 6

6.1	$A = P(1+i)^n$ $78\ 000 = 39\ 000(1 + 0{,}18)^n$ $2 = (1 + 0{,}18)^n$ $\log_{(1+0{,}18)} 2 = n$ n = 4,187 years $\therefore$ year 2031	✓ substitution ✓ use of logs ✓ value for n ✓ answer	(4)
6.2.1	$Fv = \frac{x\left[(1+i)^n - 1\right]}{i}$ $Fv = \frac{3\ 200\left[\left(1 + \frac{0{,}0975}{12}\right)^{240} - 1\right]}{\frac{0{,}0975}{12}}$ Fv = R2 352 649,68	✓ value for i and n ✓ substitution into correct formula ✓ R2 352 649,68	(3)
6.2.2	240 × R3 200 = R768 000 $\frac{768\ 000}{2\ 352\ 649{,}68} \times 100$ = 32,64 % $\therefore$ 67,36% of the total investment is interest. **OR** 240 × R3 200 = R768 000 R2 352 649,68 – R768 000 = R1 584 649,68 $\frac{1\ 584\ 649{,}68}{2\ 352\ 649{,}68} \times 100$ = 67,36%	✓ R768 000 ✓ 32,64% ✓ 67,36% ✓ R768 000 ✓ R1 584 649,68 ✓ 67,36%	(3)

6.2.3	$Pv = \frac{x\left(1-\left[1+i\right]^{-n}\right)}{i}$ $1\,200\,000 = \frac{x\left(1-\left[1+\frac{0,1137}{12}\right]^{-240}\right)}{\frac{0,1137}{12}}$ x = R12 689,84 $\therefore$ Yes, she will be able to afford to purchase the property. **OR** $Pv = \frac{x\left(1-\left[1+i\right]^{-n}\right)}{i}$ $Pv = \frac{13000\left(1-\left[1+\frac{0,1137}{12}\right]^{-240}\right)}{\frac{0,1137}{12}}$ $Pv = R1229330,40$ $\therefore$ Yes, she will be able to afford to purchase the property.	✓ values for i and n ✓ substitution into correct formula ✓ R12 689,84 ✓ conclusion ✓ values for i and n ✓ substitution into correct formula ✓ R1229330,40 ✓ conclusion	(4)
			[14]

QUESTION 7

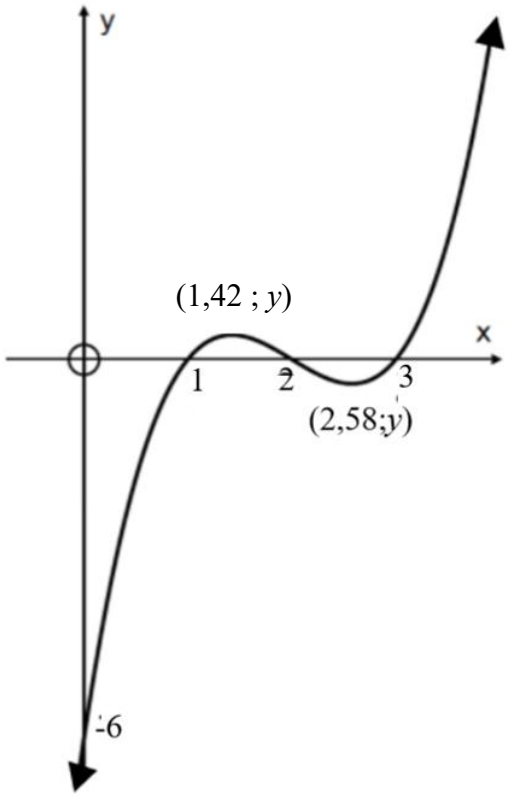
7.1	$f(x) = -x + 2x^2$ $f(x+h) = -(x+h) + 2(x+h)^2$ $f(x+h) = -x - h + 2(x^2 + 2xh + h^2)$ $f(x+h) = -x - h + 2x^2 + 4xh + 2h^2$ $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \to 0} \frac{-x - h + 2x^2 + 4xh + 2h^2 - (-x + 2x^2)}{h}$ $f'(x) = \lim_{h \to 0} \frac{-x - h + 2x^2 + 4xh + 2h^2 + x - 2x^2}{h}$ $f'(x) = \lim_{h \to 0} \frac{-h + 4xh + 2h^2}{h}$ $f'(x) = \lim_{h \to 0} \frac{h(-1 + 4x + 2h)}{h}$ $f'(x) = \lim_{h \to 0} (-1 + 4x + 2h)$ $f'(x) = -1 + 4x$ **OR** $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \to 0} \frac{-(x+h) + 2(x+h)^2 - (-x + 2x^2)}{h}$ $f'(x) = \lim_{h \to 0} \frac{-x - h + 2x^2 + 4xh + 2h^2 - (-x + 2x^2)}{h}$ $f'(x) = \lim_{h \to 0} \frac{-x - h + 2x^2 + 4xh + 2h^2 + x - 2x^2}{h}$ $f'(x) = \lim_{h \to 0} \frac{-h + 4xh + 2h^2}{h}$ $f'(x) = \lim_{h \to 0} \frac{h(-1 + 4x + 2h)}{h}$ $f'(x) = \lim_{h \to 0} (-1 + 4x + 2h)$ $f'(x) = -1 + 4x$ **NOTE: Penalise ONE mark for incorrect notation in this question.**	✓ $f(x+h)$ ✓ substitution ✓ simplification ✓ factorisation ✓ answer ✓ substitution ✓ $f(x+h)$ ✓ simplification ✓ factorisation ✓ answer	(5)

7.2	$y = 2x^3 - 6x^2 + 1$ $\frac{dy}{dx} = 6x^2 - 12x$	✓ $6x^2$ ✓ $-12x$	(2)
7.3	$f(x) = \frac{\sqrt{x}}{x} - 9x \qquad g(x) = -16x$ $D_x\left[f(x) + \frac{1}{2}g(x)\right]$ $D_x\left[\frac{\sqrt{x}}{x} - 9x + \frac{1}{2}(-16x)\right]$ $D_x\left[x^{\frac{1}{2}}.x^{-1} - 9x - 8x\right]$ $D_x\left[x^{-\frac{1}{2}} - 17x\right]$ $= -\frac{1}{2}x^{-\frac{3}{2}} - 17$	✓ substitution ✓ $x^{-\frac{1}{2}}$ ✓ $-17x$ ✓ derivative of first term IF exponent is negative ✓ derivative of second term	(5)

[12]

QUESTION 8

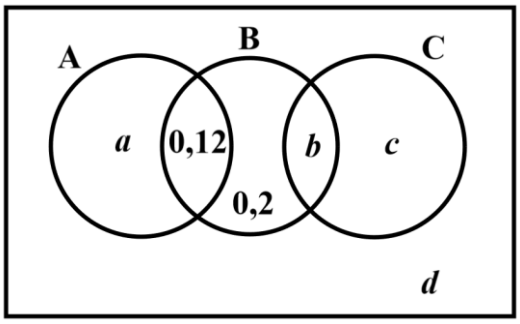
8.1	$f(x) = x^3 - ax^2 + bx - 6$ $f'(x) = 3x^2 - 2ax + b$ $f''(x) = 6x - 2a$ $f''(2) = 6(2) - 2a = 0$ $12 = 2a$ $\therefore a = 6$ $f'(x) = 3x^2 - 2(-(6))x + b$ $26 = 3(-1)^2 + 12(-1) + b$ $\therefore b = 11$	✓ $f'(x)$ ✓ $f''(x)=0$ ✓ substitution ✓ sub (–1;26) into $f'(x)$	(4)
8.2	$f(x) = x^3 - 6x^2 + 11x - 6$ $f(x) = (x-1)(x^2 - 5x + 6)$ $f(x) = (x-1)(x-2)(x-3)$ $x = 1 \quad \text{of} \quad x = 2 \quad \text{of} \quad x = 3$ **Accept any method**	✓ trinomial ✓ factors ✓ both other x-values	(3)

8.3	$f(x)=x^3-6x^2+11x-6$ $f'(x)=3x^2-12x+11$ $0=3x^2-12x+11$ $x=\frac{-(-12)\pm\sqrt{(-12)^2-4(3)(11)}}{2(3)}$ $x=\frac{6\pm\sqrt{3}}{3}$ $x\neq 2,58$ or $x=1,42$	✓ derivative = 0 ✓ substitution into quadratic formula ✓ answer with selection	(3)
8.4	$f''(x)=6x-12$ $f''(4)=6(4)-12$ $f''(4)=12$ $f''(x)>0 \therefore$ concave up	✓ sub $x=4$ into $f''(x)$ ✓ answer ✓ interpretation	(3)
8.5		✓ shape ✓ all intercepts ✓ both turning points	(3)
8.6	$f'(x)=3x^2-6x+11$ $f'(0)=11$ $y=11x-6$	✓ $m=11$ ✓ answer	(2)
			[18]

QUESTION 9

9.1	Horizontal length $= 2x$ Vertical length $= g(x) - f(x)$ $= -x^2 + 12 - \left(\frac{1}{2}x^2 - 6\right)$ $= -\frac{3}{2}x^2 + 18$	✓ horizontal length $= 2x$ ✓ $g(x) - f(x)$ ✓ $= -\frac{3}{2}x^2 + 18$	(3)
9.2	$A(x) = 2x \times \left(-\frac{3}{2}x^2 + 18\right)$ $A(x) = -3x^3 + 36x$ $A'(x) = -9x^2 + 36$ $9x^2 - 36 = 0$ $9(x^2 - 4) = 0$ $(x-2)(x+2) = 0$ $\therefore x = 2$ or $x \neq -2$ $A(2) = -3(2)^3 + 36(2)$ $A = 48$ units^2 **NOTE: derivative = 0 must be explicitly stated and may not be implied.**	✓ setting up expression ✓ simplification of expression ✓ derivative=0 ✓ both values of x ✓ answer	(5)
			[8]

QUESTION 10

10.1.1	$P(A \text{ and } C) = 0$	✓ answer	(1)
10.1.2	$P(B \text{ and } C) = P(B) \times P(C)$ $P(B \text{ and } C) = 0,4 \times 0,2$ $P(B \text{ and } C) = 0,08$ or $\frac{2}{25}$	✓ $0,4 \times 0,2$ ✓ answer	(2)
			
10.2	$a = 0,18$ or $\frac{9}{50}$ $b = 0,08$ or $\frac{2}{25}$ $c = 0,12$ or $\frac{3}{25}$ $d = 0,3$ or $\frac{3}{10}$	✓ value of a ✓ value of b ✓ value of c ✓ value of d	(4)
			[7]

QUESTION 11

11.1	9! $= 362\ 880$	✓ 9! ✓ answer (9! or 362 880)	(2)
11.2.1	$3! \times 7!$ $= 30\ 240$ $P(together) = \frac{3! \times 7!}{9!}$ $P(together) = \frac{30\ 240}{362\ 880}$ $P(together) = \frac{1}{12}$ **OR** $3! \times 11!$ $=239500800$ $P(together) = \frac{3! \times 11!}{13!}$ $P(together) = \frac{1}{26}$	✓ $3! \times 7!$ ✓ method ✓ answer ✓ $3! \times 11!$ or 239500800 ✓ method (divide by 13!) ✓ answer	(3)
11.2.2	Total! – together! $= 9! – (2! \times 8!)$ $= 282\ 240$ **OR** Total! – together! $=13! – (2! \times 10!)$ $=62\ 197\ 632\ 000$	✓ method ✓ $2! \times 8!$ ✓ answer ✓ method ✓ $2! \times 10!$ ✓ answer	(3)
			[8]

TOTAL: 150

FINAL

KWAZULU-NATAL PROVINCE

EDUCATION

REPUBLIC OF SOUTH AFRICA

STANDARDISED PROVINCIAL ASSESSMEMT

GRADE 12

MATHEMATICS P1

SEPTEMBER 2026

PREPARATORY EXAMINATION

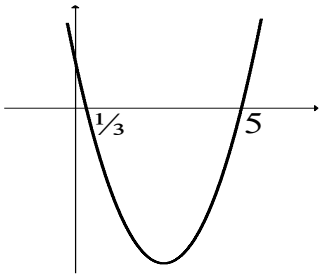
MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 16 pages.

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QUESTION 1

1.1.1	$2x-4x^2=0$ $2x(1-2x)=0$ $x=0$ or $x=\frac{1}{2}$	✓ A common factor ✓ CA ✓ CA answers (3)
1.1.2	$x^2-5=-8x$ $x^2+8x-5=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $x=\frac{-(8)\pm\sqrt{(8)^2-4(1)(-5)}}{2(1)}$ $x=-8,58$ or $x=0,58$ Penalise for incorrect rounding: 1 mark; only in this question.	✓A standard form ✓CA substitution ✓CA ✓CA answers (4)
1.1.3	$3x^2-16x\le-5$ $3x^2-16x+5\le0$ $(3x-1)(x-5)\le0$ CVs: $\frac{1}{3}$; 5  $\frac{1}{3}\le x\le5$ **OR** $x\in\left[\frac{1}{3};5\right]$	✓A $3x^2-16x+5\le0$ ✓CA critical values ✓✓CA CA answer (4)
1.1.4	$\left(\sqrt{x-1}-3\right)\left(\sqrt{x-1}+2\right)=-6$ $x-1-\sqrt{x-1}-6=-6$ $\sqrt{x-1}=x-1$ $\left(\sqrt{x-1}\right)^2=(x-1)^2$ $x-1=x^2-2x+1$ $x^2-3x+2=0$ $(x-1)(x-2)=0$ $x=1$ or $x=2$ **OR**	✓A LHS of equation ✓CA isolating the surd ✓CA squaring both sides ✓CA standard form ✓CA both answers (5) **OR**

	Let $k=\sqrt{x-1}$: $\therefore (k-3)(k+2)=-6$ $k^2-k-6=-6$ $k^2-k=0$ $k(k-1)=0$ $k=0 \quad \text{or} \quad k=1$ $\sqrt{x-1}=1 \quad \text{or} \quad \sqrt{x-1}=0$ $x-1=1 \qquad x-1=0$ $x=2 \qquad x=1$	✓A $k^2-k-6=-6$ ✓CA factorisation ✓CA values of k ✓CA squaring both sides ✓CA both answers (5)
1.2	$x-2y=3$ $x=3+2y$ $3y^2-5xy=24+16y$ $3(3+2y)^2-5y(3+2y)=24+16y$ $2y^2+5y+3=0$ $(2y+3)(y+1)=0$ $y=-\frac{3}{2} \text{ or } y=-1$ $x=3+2\left(-\frac{3}{2}\right) \text{ or } x=3+2(-1)$ $x=0 \qquad \text{or} \quad x=1$	✓A making x subject of the formula ✓CA substitution ✓CA standard form ✓CA y-values ✓CA x-values (5)
	OR $y=\frac{x-3}{2}$ $3x^2-5xy=24+16y$ $3x^2-5x\left(\frac{x-3}{2}\right)=24+16\left(\frac{x-3}{2}\right)$ $x^2-x=0$ $x(x-1)=0$ $x=0 \text{ or } x=1$ $y=\frac{0-3}{2} \text{ or } y=\frac{1-3}{2}$ $y=-\frac{3}{2} \quad \text{or} \quad y=-1$	**OR** ✓A making y the subject of the formula ✓CA substitution ✓CA standard form ✓CA x-values ✓CA y-values (5)

1.3	$7^{\frac{x}{2}} + 5^{\frac{y}{3}} = 7^2 + 5^1$ $\frac{x}{2} = 2 \quad \text{and} \quad \frac{y}{3} = 1$ $x = 4 \quad \text{and} \quad y = 3$ $\therefore \text{P} = 4 \times 3$ $\text{P} = 12$	✓A $7^{\frac{x}{2}} + 5^{\frac{y}{3}} = 7^2 + 5^1$ ✓A equating exponents with the same base ✓A value of x and value of y ✓A value of P (4)
		[25]

QUESTION 2

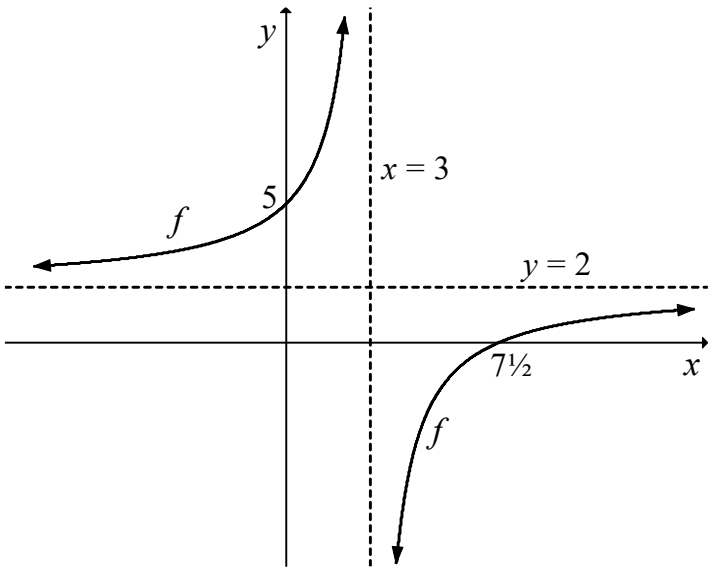
2.1.	$a + 3d = 15$ .....(1) $a + 11d = 47$ ....(2) Subtract (1) from (2): $8d = 32$ $d = 4$ $a + 3(4) = 15$ $a = 3$ 3 ; 7 ; …….	✓A both equations ✓CA solving simultaneously ✓CA value of d ✓CA answer (4)
2.2.1	$\frac{9}{4}$	✓A answer (1)
2.2.2	$r = \frac{1}{2}$ $S_\infty = \frac{a}{1-r}$ $= \frac{18}{1-\frac{1}{2}}$ $= 36$ $S_6 = \frac{a\left(r^n - 1\right)}{r-1}$ $= \frac{18\left[\left(\frac{1}{2}\right)^6 - 1\right]}{\frac{1}{2} - 1}$ $= 35,44$ $\therefore$ Total area of squares smaller than Square 6 $= 36 - 35,44 = 0,56 \text{ cm}^2$ **OR**	✓A value of r ✓CA substitution in S_∞ ✓CA value of S_∞ ✓CA substitution in S_6 ✓CA value of S_6 ✓CA answer (6)

...	$r = \frac{1}{2}$ $T_7 = ar^6 = 18\left(\frac{1}{2}\right)^6$ $= \frac{9}{32}$ $S_\infty = \frac{a}{1-r}$ $= \frac{\frac{9}{32}}{1-\frac{1}{2}}$ $= \frac{9}{16} = 0,56$	✓A value of r ✓CA substitution in T_7 ✓CA value of T_7 ✓CA substitution of a in S_∞ ✓CA substitution of r in S_∞ ✓CA answer (6)
2.2.3	side length of Square $1 = \sqrt{18} = 3\sqrt{2}$ side length of Square $2 = \sqrt{9} = 3$ $r = \frac{3}{3\sqrt{2}} = \frac{1}{\sqrt{2}}$ $T_n = ar^{n-1}$ $\frac{3}{8} = 3\sqrt{2}.\left(\frac{1}{\sqrt{2}}\right)^{n-1}$ $\left(\frac{1}{\sqrt{2}}\right)^{n-1} = \left(\frac{1}{\sqrt{2}}\right)^7$ $n = 8$ The 8th square will have a side length of $\frac{3}{8}$ cm. **OR** Area of square $= \left(\frac{3}{8}\right)^2 = \frac{9}{64}$ $a = 18\ ;\quad r = \frac{1}{2}$ $T_n = ar^{n-1}$ $\frac{9}{64} = 18\left(\frac{1}{2}\right)^{n-1}$ $\left(\frac{1}{2}\right)^7 = \left(\frac{1}{2}\right)^{n-1}$ $n = 8$ The 8th square will have a side length of $\frac{3}{8}$ cm.	✓A side length of Square 1 ✓CA value of r ✓CA substitution in $T_n = ar^{n-1}$ ✓CA same base in LHS and RHS ✓CA answer (5) **OR** ✓A area of square ✓A value of a ✓CA substitution in $T_n = ar^{n-1}$ ✓CA same base in LHS and RHS ✓CA answer (5)
		[16]

QUESTION 3

3.1	$\sum_{k=10}^{25}(7-5k) = 7-5(10)+7-5(11)+7-5(12)+...\text{to 16 terms}$ $= -43-48-53+....$ to 16 terms $\therefore a=-43; \quad d=-5$ $n=16$ $S_n = \frac{n}{2}\left[2a+(n-1)d\right]$ $= \frac{16}{2}\left[2(-43)+15(-5)\right]$ $= -1288$ **OR** $a=-43; \quad l=7-5(25)=-118$ $n=16$ $S_n = \frac{n}{2}[a+l]$ $= \frac{16}{2}[-43-118]$ $= -1288$	✓A values of a and d ✓A value of n ✓CA substitution ✓CA answer (4) **OR** ✓A values of a and l ✓A value of n ✓CA substitution ✓CA answer (4)
3.2	$T_4 = a.4^2+4b+6 = 16a+4b+6 = 26$ $16a+4b = 20$ $4a+b = 5$ .....(1) $T_3 - T_2 = 7$ $9a+3b+6-(4a+2b+6) = 7$ $5a+b = 7$.....(2) (2) – (1): $a = 2$ Substitute $a=2$ in (1): $4(2)+b=5$ $b = -5(2)+7 = -3$	✓A use $T_4 = 26$ to obtain equation i.t.o. a and b ✓A use $T_3 - T_2 = 7$ to obtain equation i.t.o. a and b ✓CA value of a ✓CA value of b (4)
		[8]

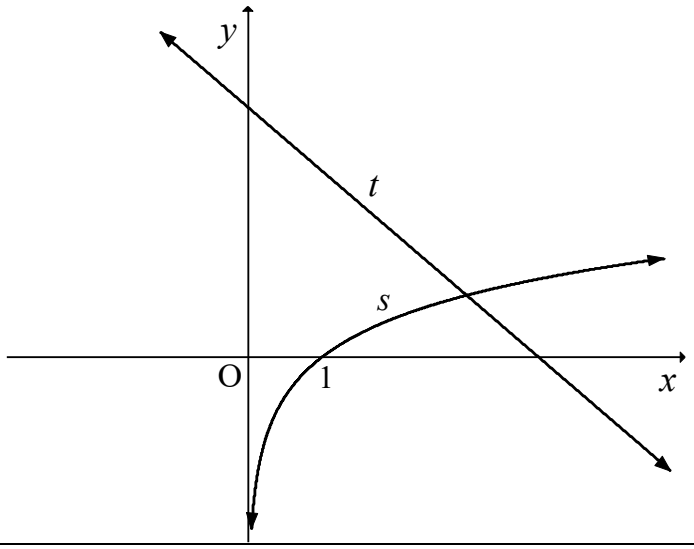
QUESTION 4

4.1	$x = 3$ $y = 2$	✓A $x = 3$ ✓A $y = 2$ (2)
4.2.1	For the x-intercept, $y = 0$: $\therefore 0 = \frac{-9}{x-3} + 2$ $-2(x-3) = -9$ $-2x = -15$ $x = 7\frac{1}{2}$	✓A substitute $y = 0$ ✓A x-intercept (2)
4.2.2	For the y-intercept, $x = 0$: $\therefore y = \frac{-9}{0-3} + 2$ $y = 5$	✓A y-intercept (1)
4.3		✓A shape ✓CA asymptotes ✓CA intercepts (3)
4.4	reflection around the y-axis	✓✓AA answer (2)
4.5	$-5 < p < -2$	✓✓CA; A answer (2)
		[12]

QUESTION 5

5.1	$\mathrm{R}(0\,;-6)$	✓A answer (1)
5.2	$c=-6$ $\therefore y=mx-6$ Substitute $(-7\,;8)$: $8=m(-7)-6$ $m=-2$ $\therefore y=-2x-6$	✓A $c=-6$ ✓CA substitute. $(-7\,;8)$ ✓CA answer (3)
5.3	$g(x)=x^2+5x-6$ $=x^2+5x+\left(\frac{5}{2}\right)^2-\left(\frac{5}{2}\right)^2-6$ $=\left(x+\frac{5}{2}\right)^2-\frac{49}{4}$	✓A $\left(x+\frac{5}{2}\right)^2$ ✓A $-\frac{49}{4}$ (2)
5.4	average gradient of TW $=-4$ $\frac{y-8}{x-(-7)}=-4$ $y-8=-4(x+7)$ $y=-4x-20$ $\therefore x^2+5x-6=-4x-20$ $x^2+9x+14=0$ $(x+7)(x+2)=0$ $x\neq-7$ or $x=-2$ $\therefore \mathrm{W}(-2\,;-12)$	✓A substitution for ave. gradient ✓CA y subject of the formula ✓CA substitute $y=x^2+5x-6$ ✓CA factors ✓CA answer (5)
5.5	For x intercept of h: $-2x-6=0$ $x=-3$ $\frac{g(x)}{h(x)}\leq 0$ for $-6\leq x<-3$ or $x\geq 1$	✓CA x intercept of h ✓✓CA $-6\leq x<-3$ ✓A $x\geq 1$ (4)
		[15]

QUESTION 6

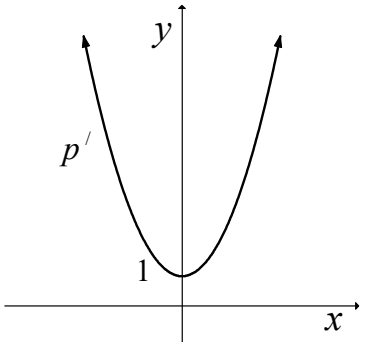
6.1		*s*: ✓A shape ✓A x-intercept of 1 (2)
6.2	s^{-1}: $x = \log_3 y$ $\therefore y = 3^x$ Answer only: Full marks	✓A swapping of x and y ✓A answer (2)
6.3	Rewrite $\log_3(4-x) = x$: $3^x = 4 - x$ or: $3^x = -x + 4$ Reflect the graph of s in the line $y = x$ to obtain the graph of the inverse: $s^{-1}(x) = 3^x$. The x-coordinate of the point of intersection between $t(x) = -x + 4$ and $s^{-1}(x) = 3^x$ will be the solution of $3^x = 4 - x$, and therefore also of: $\log_3(4-x) = x$.	✓A $3^x = -x + 4$ ✓A reflect in the line $y = x$ ✓A point of intersection between t and s^{-1} (3)
6.4	$x = 1$	✓A answer (1)
		[8]

QUESTION 7

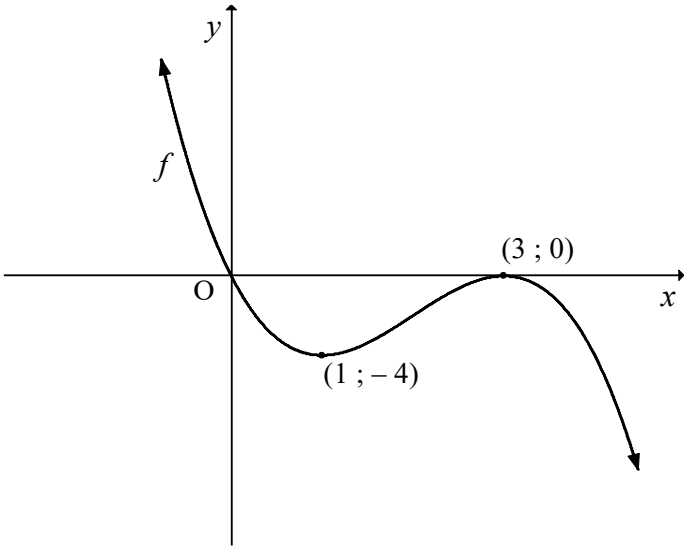
7.1	Let $P = x$; $A = 2x$; $n =$ number of years $A = P(1+i)^n$ $2x = x\left(1+\frac{0,073}{4}\right)^{4n}$ $2 = 1,01825^{4n}$ $4n = \log_{1,01825} 2$ $n = 9,58$ After 9,6 years.	✓A $P = x$ and $A = 2x$ or $\frac{A}{P} = 2$ ✓A substitution ✓CA use of logarithms ✓CA answer (4)
7.2	$F = \frac{x\left[(1+i)^n - 1\right]}{i}$ $F = \frac{2500\left[\left(1+\frac{0,08}{12}\right)^{60} - 1\right]}{\frac{0,08}{12}}$ $= R183692,14$	✓A $n = 60$ ✓A $i = \frac{0,08}{12}$ ✓CA substituting into correct formula ✓CA answer (4)
7.3.1	$P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $82000 = \frac{3200\left[1-\left(1+\frac{0,12}{12}\right)^{-n}\right]}{\frac{0,12}{12}}$ $\left(1+\frac{0,12}{12}\right)^{-n} = 1 - \frac{82000 \times \frac{0,12}{12}}{3200}$ $= 0,74375$ $-n = \log_{\left(1+\frac{0,12}{12}\right)} 0,74375$ $n = 29,75281189...$ She will have to pay 30 instalments.	✓A substituting into correct formula ✓CA use of logarithms ✓CA value of n ✓CA answer (4)

7.3.2	Outstanding balance after 29 instalments = present value of outstanding instalments $= \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $= \frac{3\,200\left[1-\left(1+\frac{0,12}{12}\right)^{-0,75281189...}\right]}{\frac{0,12}{12}}$ $= \text{R}2388,08$ $\text{Final instalment} = 2388,08\left(1+\frac{0,12}{12}\right)^{1}$ $= \text{R}2411,96$ **OR** OB = A – F $= P(1+i)^{n} - \frac{x\left[(1+i)^{n}-1\right]}{i}$ $= 82\,000\left(1+\frac{0,12}{12}\right)^{29} - \frac{3200\left[\left(1+\frac{0,12}{12}\right)^{29}-1\right]}{\frac{0,12}{12}}$ $= \text{R}2388,08$ $\text{Final instalment} = 2388,08\left(1+\frac{0,12}{12}\right)^{1}$ $= \text{R}2411,96$ **OR** $82\,000 = \frac{3200\left[1-\left(1+\frac{0,12}{12}\right)^{-29}\right]}{\frac{0,12}{12}} + \text{Final instalment}\left(1+\frac{0,12}{12}\right)^{-30}$ $\text{Final instalment} = \left(82\,000 - \frac{3\,200\left[1-\left(1+\frac{0,12}{12}\right)^{-29}\right]}{\frac{0,12}{12}}\right) \div \left(1+\frac{0,12}{12}\right)^{-30}$ $= \text{R}2411,96$	✓CA substituting into correct formula ✓CA compounding ✓CA answer (3) **OR** ✓CA substituting into correct formula ✓CA compounding ✓CA answer (3)
		[15]

QUESTION 8

8.1	$f(x+h)=(x+h)-3(x+h)^2$ $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $=\lim_{h\to 0}\frac{(x+h)-3(x+h)^2-(x-3x^2)}{h}$ $=\lim_{h\to 0}\frac{x+h-3x^2-6xh-3h^2-x+3x^2}{h}$ $=\lim_{h\to 0}\frac{h-6xh-3h^2}{h}$ $=\lim_{h\to 0}\frac{h(1-6x-3h)}{h}$ $=\lim_{h\to 0}(1-6x-3h)$ $=1-6x$ Penalise for incorrect notation, one mark, only in this question.	✓A expression for $f(x+h)$ ✓CA substitution ✓CA simplification ✓CA common factor ✓CA answer (5)
8.2	$D_x\left(\frac{4x^2+x+2\sqrt{x}}{2x^2}\right)$ $=D_x\left(2+\frac{1}{2}x^{-1}+x^{-\frac{3}{2}}\right)$ $=-\frac{1}{2}x^{-2}-\frac{3}{2}x^{-\frac{5}{2}}$	✓A $2+\frac{1}{2}x^{-1}$ ✓A $x^{-\frac{3}{2}}$ ✓CA $-\frac{1}{2}x^{-2}$ ✓CA $-\frac{3}{2}x^{-\frac{5}{2}}$ (4)
8.3	$p(x)=5x^3+x$ $p'(x)=15x^2+1$ $15x^2\geq 0$, for all $x\in R$ $15x^2+1>0$ for all $x\in R$ $\therefore p'(x)>0$, for all $x\in R$ p is increasing for all $x\in R$	✓A derivative ✓A $15x^2\geq 0$, for all $x\in R$ ✓A $p'(x)>0$, for all $x\in R$ (3)
	OR $p'(x)=15x^2+1$  $\therefore p'(x)>0$, for all $x\in R$ p is increasing for all $x\in R$	**OR** ✓A derivative ✓A graph of $p'(x)$ is above x-axis for all $x\in R$ ✓A $p'(x)>0$, for all $x\in R$ (3)
		[12]

QUESTION 9

9.1.1		✓A shape ✓A passing through origin ✓A x-intercept $(3;0)$ ✓A turning point: $(1;-4)$ (4)
9.1.2	$(3\ ;4)$	✓A answer ✓A answer (2)
9.1.3	$f(x)=-x(x-3)^2$ $=-x(x^2-6x+9)$ $=-x^3+6x^2-9x$ $f'(x)=-3x^2+12x-9$ $f''(x)=-6x+12$	✓A $-x^3+6x^2-9x$ ✓CA $f'(x)$ ✓CA $f''(x)$ (3)
9.1.4	$f''(0)=-6(0)+12=12$ $\therefore f''(0)>0$ $\therefore$ the graph of f is concave up at $(0\ ;0)$.	✓CA value of $f''(0)$ ✓CA show that $f''(0)>0$ ✓CA answer (3)
9.2	$y=12x+k$ will be a tangent to g when: $3x^2=12$ $x^2=4$ $x=2$ or $x=-2$ For $x=2$: $x^3+1=12x+k$ $2^3+1=12(2)+k$ $\therefore k=-15$ For $x=-2$: $x^3+1=12x+k$ $(-2)^3+1=12(-2)+k$ $\therefore k=17$ $y=12x+k$ will be intersecting g at 3 distinct points for $-15<k<17$. OR	✓A equating derivatives ✓CA x-values ✓CA value of k ✓CA value of k ✓CA answer (5) **OR**

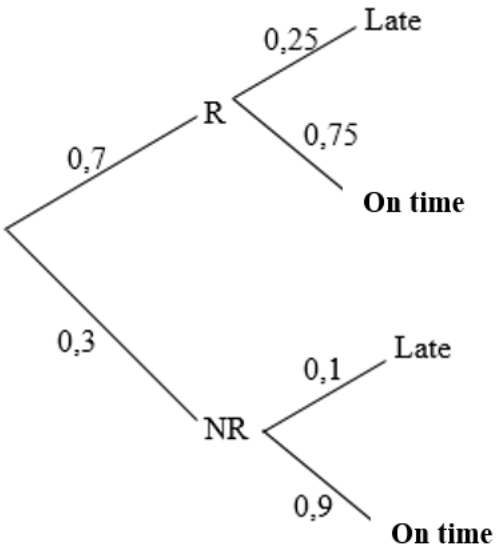
9.2	$y=12x+k$ will be a tangent to g when: $3x^2=12$ $x^2=4$ $x=2$ or $x=-2$ For $x=2$: $x^3+1=12x+k$ $2^3+1=12(2)+k$ $\therefore k=-15$ For $x=-2$: $x^3+1=12x+k$ $(-2)^3+1=12(-2)+k$ $\therefore k=17$ $y=12x+k$ will be intersecting g at 3 distinct points for $-15<k<17$. **OR** $g(x)=12x+k$ $x^3+1=12x+k$ $x^3-12x+1=k$ Consider the graph of $x^3-12x+1$: Turning points when $3x^2-12=0$ $x^2=4$ $x=2$ or $x=-2$ For $x=2$: $x^3+1=12x+k$ $2^3+1=12(2)+k$ $\therefore k=-15$ For $x=-2$: $x^3+1=12x+k$ $(-2)^3+1=12(-2)+k$ $\therefore k=17$ $y=12x+k$ will be intersecting g at 3 distinct points for $-15<k<17$.	✓A equating derivatives ✓CA x-values ✓CA value of k ✓CA value of k ✓CA answer (5) **OR** ✓A $x^3+1=12x+k$ ✓CA x-values ✓CA value of k ✓CA value of k ✓CA answer (5)
		[17]

QUESTION 10

10.1	TSA of box $= 2(x)(x)+2(x)(h)+2(x)(h) = 2x^2+4xh$ $2x^2+4xh = 1350$ $h = \frac{1350}{4x}-\frac{x}{2}$ Volume $= x^2h$ $= x^2\left(\frac{1350}{4x}-\frac{x}{2}\right)$ $V(x) = \frac{675x}{2}-\frac{x^3}{2}$	✓A expression for TSA ✓A equating to 1350 ✓A $h = \frac{1350}{4x}-\frac{x}{2}$ ✓A substitution into formula for volume of rectangular prism (4)
10.2	$V'(x) = \frac{675}{2}-\frac{3x^2}{2}$ For maximum volume: $V'(x) = 0$ $3x^2 = 675$ $x^2 = 225$ $x = 15\,\text{cm}$	✓A derivative ✓A derivative $= 0$ ✓CA answer (3)
		[7]

QUESTION 11

11.1.1	$P(\text{A and B}) = P(\text{A})\times P(\text{B})$ $0,28 = (0,42+0,28)\times(0,28+x)$ $0,4 = 0,28+x$ $x = 0,4-0,28$ $x = 0,12$	✓A subst. into correct formula ✓A simplification ✓CA answer (3)
11.1.2	$y = 1-0,82 = 0,18$	✓CA answer (1)
11.1.3	$P(\text{A or B}) = P(\text{A})+P(\text{B})-P(\text{A and B})$ $= 0,42+0,28-0,28$ $= 0,82$ **OR** $P(\text{A or B}) = 0,42+0,28+0,12$ $= 0,82$ **OR** $P(\text{A or B}) = 1-y$ $= 0,82$	✓CA answer (1) **OR** ✓CA answer (1) **OR** ✓CA answer (1)

11.2	 $P(\text{on time when raining}) = 0,7 \times 0,75$ $P(\text{on time when not raining}) = 0,3 \times 0,9$ $P(\text{on time}) = (0,7 \times 0,75) + (0,3 \times 0,9)$ $= 0,795$	✓A $0,7 \times 0,75$ ✓A $0,3 \times 0,9$ ✓CA adding ✓CA answer (4)
11.3.1	$8! = 40\,320$	✓A answer (1)
11.3.2	$8.7.6.5 = 1680$	✓A answer (1)
11.3.3	$n(S) = 2!6! = 1440$ $n(\text{event}) = 2!3!3!2! = 144$ $P(\text{event}) = \frac{n(\text{event})}{n(S)} = \frac{144}{1440}$ $= \frac{1}{10}$ **OR** $n(S) = 2!6! = 2!720$ $= 2!(3!3! + 3!3!) = 2!72$ $= \frac{2!72}{2!720}$ $= \frac{1}{10}$	✓A $n(S)$ ✓A $n(\text{event})$ ✓CA $\frac{n(\text{event})}{n(S)}$ ✓CA answer (4)
		[15]

TOTAL: 150

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GRADE/*GRADE* 12

MATHEMATICS P1/*WISKUNDE V1*
MARKING GUIDELINES/*NASIENRIGLYNE*
SEPTEMBER 2026

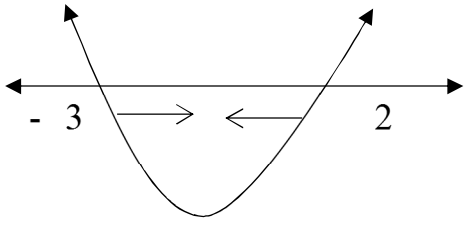
MARKS/*PUNTE*: 150

This marking guidelines consists of 18 pages/ *Hierdie nasienriglyne bestaan uit 18 bladsye*

NOTE/*NOTA*:

- If a candidate answers a question TWICE, only mark the FIRST attempt/ *As 'n kandidaat 'n vraag TWEE keer beantwoord, merk slegs die EERSTE poging*
- Consistent accuracy applies in ALL aspects of the marking guidelines/ *Konsekwente akkuraatheid is van toepassing in ALLE aspekte van die nasienriglyne*

QUESTION 1/*VRAAG 1*

1.1	1.1.1	$y+\frac{1}{y}=2$ $y^2-2y+1=0$ $(y-1)(y-1)=0$ $y=1$	✓standard form/*standaardvorm* ✓answer/*antwoord*	(2)
	1.1.2	$(2x^2+3x)+\frac{1}{(2x^2+3x)}=2$ $2x^2+3x=1$ $2x^2+3x-1=0$ $x=\frac{-3\pm\sqrt{(3)^2-4(2)(-1)}}{2(2)}$ $x=-1,78$ or / *of* $x=0,28$	✓standard form/*standaardvorm* ✓substitution/*vervanging* ✓ answer/*antwoord* ✓ answer/*antwoord*	(4)
1.2	1.2.1	$x^2+x-6<0$ $(x+3)(x-2)<0$ CV $x=-3$ or / *of* $x=2$  $-3<x<2$	✓critical values/*kritieke waardes* ✓✓answer/*antwoord*	(3)

	1.2.2	$5+\sqrt{x+5}=\frac{14}{\sqrt{x+5}}$ $5\sqrt{x+5}+x+5=14$ $5\sqrt{x+5}=9-x$ $25(x+5)=81-18x+x^2$ $x^2-43x-44=0$ $(x-44)(x+1)=0$ $x\neq 44$ or / *of* $x=-1$	✓cross multiply/*maal KGV* ✓isolating surds/*isoleer wortel* ✓squaring/*vierkant* ✓standard form/*standaardvorm* ✓answer with selection/ *antwoord met seleksie*	(5)
	1.2.3	$9^{x+1}-10.3^x+1=0$ $3^{2x}.9-10.3^x+1=0$ $(9.3^x-1)(3^x-1)=0$ $3^x=\frac{1}{9}$ or / *of* $3^x=1$ $3^x=3^{-2}$ or / *of* $3^x=3^0$ $x=-2$ or / *of* $x=0$	✓factorisation/*faktorisering* ✓both equations/*beide vgl* ✓ answer/*antwoord* ✓ answer/*Antwoord*	(4)
1.3	1.3.1	Surface Area / *Buite oppervlakte* $=2lb+2lh+2bh$ $2x^2+2xy+2xy=288$ $2x^2+4xy=288$ $x^2+2xy-144=0$	✓ $2x^2+2xy+2xy=288$ ✓ $2x^2+4xy=288$	(2)
	1.3.2	$x^2+2xy-144=0$ $y=21-2x$ $x^2+2x(21-2x)-144=0$ $x^2+42x-4x^2-144=0$ $-3x^2+42x-144=0$ $x^2-14x+48=0$ $(x-6)(x-8)=0$ $x=6$ or / *of* $x=8$ $y=9$ or / *of* $y=5$ **OR/*OF***	✓substitution/*vervanging* ✓standard form/*standaardvorm* ✓x – values/*waardes* ✓y - values/*waardes* **OR/*OF***	(4)

		$x^2+2xy-144=0$ $\frac{21-y}{2}=x$ $\left(\frac{21-y}{2}\right)^2+2y\left(\frac{21-y}{2}\right)-144=0$ $\frac{441-42y+y^2}{4}+\frac{42y-2y^2}{2}-144=0$ $441-42y+y^2+84y-4y^2-576=0$ $-3y^2+42y-135=0$ $y^2-14y+45=0$ $(y-5)(y-9)=0$ $y=5$ or / *of* $y=9$ $x=8$ or / *of* $x=6$	✓substitution/*vervanging* ✓ standard form/*standaardvorm* ✓y - values/*waardes* ✓x - values /*waardes*	(4)
				[24]

QUESTION 2/*VRAAG 2*

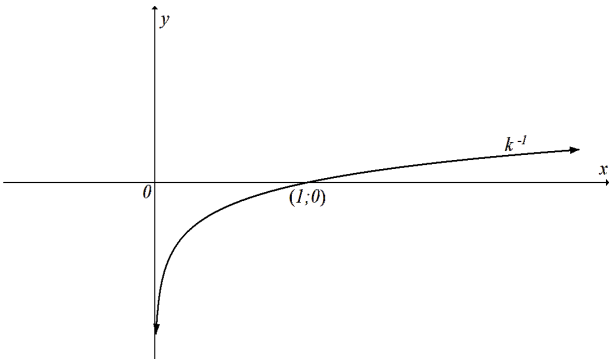
2.1	2.1.1	$r=\frac{T_2}{T_1}=\frac{(x-3)^2}{(x-3)}$ $r=(x-3)$ $-1<(x-3)<1$ $2<x<4$	✓value of *r*/*waarde van r* ✓condition/*voorwaarde* ✓answer/*Antwoord*	(3)
	2.1.2	$S_\infty=\frac{x-3}{1-(x-3)}$ $=\frac{x-3}{4-x}$	✓substitution/*vervanging* ✓answer/*Antwoord*	(2)
	2.1.3	$S_\infty=\frac{2.5-3}{1-(2.5-3)}$ $=\frac{2.5-3}{4-2.5}$ $=-0.33$	✓substitution/*vervanging* ✓answer/*Antwoord*	(2)
2.2	2.2.1	$4 + 6 + 8 + ...$ $a=4$ $d=2$ $\frac{n}{2}[8+(n-1)2]=990$ $\frac{n}{2}[2n+6]=990$ $n^2+3n-990=0$ $(n-30)(n+33)=0$ $n=30$ or / *of* $n\neq-33$	✓expansion/*uitbrei* ✓ substitution/*vervanging* ✓standard form/*standaardvorm* ✓answer with selection/*antwoord met seleksie*	(4)

	2.2.2	$T_n = a + (n-1)d$ $T_{30} = 30 + 29(2)$ $= 62$ $S_n - S_{n-1} = S_{30} - S_{29}$ $= 990 - \left[\frac{29}{2}[8 + 28(2)]\right]$ $= 990 - 928$ $= 62$ $\therefore T_{30} = S_{30} - S_{29}$	✓substitution/*vervanging* ✓answer/*antwoord* ✓substitution/*vervanging* ✓answer/a*ntwoord*	(4)
				[15]

QUESTION 3/*VRAAG 3*

3.1	$-1\ ;\ 1\ ;\ 3\ ;\ 5\ ;$ ..... $a=-1$ $d=2$ $T_{10}=-1+9(2)$ $=17$	✓first difference/*eerste verskil* ✓substitution/*vervanging* ✓answer/*antwoord*	(3)
3.2	$T_{30}=-1+29(2)$ $=57$	✓substitution/*vervanging* ✓answer/*antwoord*	(2)
3.3	$2a=2$ $a=1$ $3a+b=-1$ $3(1)+b=-1$ $b=-4$ $a+b+c=3$ $1-4+c=3$ $c=6$	✓ $2a=2$ ✓ $3(1)+b=-1$ ✓ $1-4+c=3$	(3)
3.4	The minimum value in the sequence is 2/ *Die minimum waarde in die reeks is 2*	✓answer/*antwoord*	(1)
			[9]

QUESTION 4/*VRAAG 4*

4.1	$B(0\ ;-8)$ $3^x-9=0$ $3^x=9$ $3^x=3^2$ $x=2$ A(2 ; 0)	✓ $B(0\ ;-8)$ ✓equate to zero/*stel gelyk 0* ✓x – value/*waarde*	(3)
4.2	$g(x)=3^x-9$ $k(x)=g(x)+9$ $k(x)=3^{2x}-9+9$ $k(x)=9^x$	✓substitution/*vervanging* ✓answer/*antwoord*	(2)
4.3	$y=9^x$ $x=9^y$ $y=\log_9 x$	✓interchange x and y/*ruil x en y* ✓answer/*antwoord*	(2)
4.4		✓shape/*vorm* ✓(1 ; 0)	(2)
4.5	$x>0$	✓domain/*definisieversameling*	(1)
4.6	$h(x)=-k^{-1}(x)$ $=-\log_9(x)$	✓ $h(x)=-k^{-1}(x)$ ✓answer/*antwoord*	(2)
4.7	$\sum_{x=0}^{2}9^x-\sum_{x=3}^{4}g(x)$ $=[1+9+81]-[9+72]$ $=91-81$ $=10$	✓$[1+9+72]$ ✓$[9+72]$ ✓answer/*antwoord*	(3)
			[15]

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QUESTION 5/*VRAAG 5*

5.1	$y=\frac{a}{x-1}+2$ through / *deur* (0 ; 0) $0=\frac{a}{-1}+2$ $0=-a+2$ $a=2$ $f(x)=\frac{2}{x-1}+2$	✓subst *p* and *q*/*verv p en q* ✓subst (0 ; 0)/*vervang* (0 ; 0) ✓value of *a*/*waarde van a*	(3)
5.2	$y=mx+c$ $y=mx+0$ through / *deur* D(1 ; 2) $2=m(1)+0$ $m=2$ $y=2x$	✓substitute *c*/*vervang c* ✓gradient/*gradiënt* ✓answer/*antwoord*	(3)
5.3	$\frac{2}{x-1}+2=2x$ $\frac{2}{x-1}=2x-2$ $2=(2x-2)(x-1)$ $2x^2-4x=0$ $2x(x-2)=0$ $x\neq 0$ or / *of* $x=2$ $y=4$ C(2 ; 4)	✓equating/*gelykstel* ✓simplification/*vereenvoudiging* ✓standard form/*standaardvorm* ✓both values of *x* and *y*/ *beide waardes van x en y*	(4)
5.4	$x<0$ or / *of* $1<x<2$	✓ $x<0$ ✓ $1<x<2$ **OR/*OF*** (1 ; 2)	(2)
5.5	$-\infty<x<1$; $x\neq 0$	✓ $-\infty<x<1$ ✓ $x\neq 0$	(2)
			[14]

QUESTION 6/*VRAAG 6*

6.1	$y = a(x+p)^2 + q$ $y = a(x-1)^2 - 3$ subst / *verv* $(0\ ;-1)$ $-1 = a(0-1)^2 - 3$ $a = 2$ $y = 2(x-1)^2 - 3$ $= 2(x^2 - 2x + 1) - 3$ $= 2x^2 - 4x - 1$ $b = -4$	✓substitution/*vervanging* ✓subst $(0\ ;-1)$ /*verv* (0 ; -1) ✓value of *a*/*waarde van a* ✓ value of *b*/*waarde van b*	(4)
6.2	$1 - k < 0$ $k > 1$	✓substitution/*vervanging* ✓solution/*oplossing*	(2)
			[6]

QUESTION 7/*VRAAG 7*

7.1		$A = P(1+i)^n$ $A = 62\,000(1+0,05)^{20}$ $A = R164\ 504,46$	✓i ✓substitution/*vervanging* ✓answer/*antwoord*	(3)
7.2	7.2.1	$P_v = \frac{x[1-(1+i)^{-n}]}{i}$ $x = \frac{800000 \times \frac{0,11}{12}}{\left[1-\left(1+\frac{0,11}{12}\right)^{-240}\right]}$ $x = R8257,51$	✓i ✓n ✓substitution//*vervanging*	(3)
	7.2.2	Balance / *Balans* $= \frac{8257,51\left[1-\left(1+\frac{0,11}{12}\right)^{-60}\right]}{\frac{0,11}{12}}$ $= R379\,787,94$ **OR/*OF*** Balance / *Balans* $= A - F_v$ Balance / *Balans* $= P(1+i)^n - \frac{x[(1+i)^n - 1]}{i}$ $= 800000\left(1+\frac{0,11}{12}\right)^{180} - \frac{8257,51[\left(1+\frac{0,11}{12}\right)^{180}}{\frac{0,11}{12}}$ Balance / *Balans* = R379 786,50	✓$n = -60$ ✓ i ✓substitution/*vervanging* ✓answer/*antwoord* **OR/*OF*** ✓ $n = 180$ ✓substitution A/*verv A* ✓substitution F_v/*verv* F_v ✓answer/*antwoord*	(4) (4)

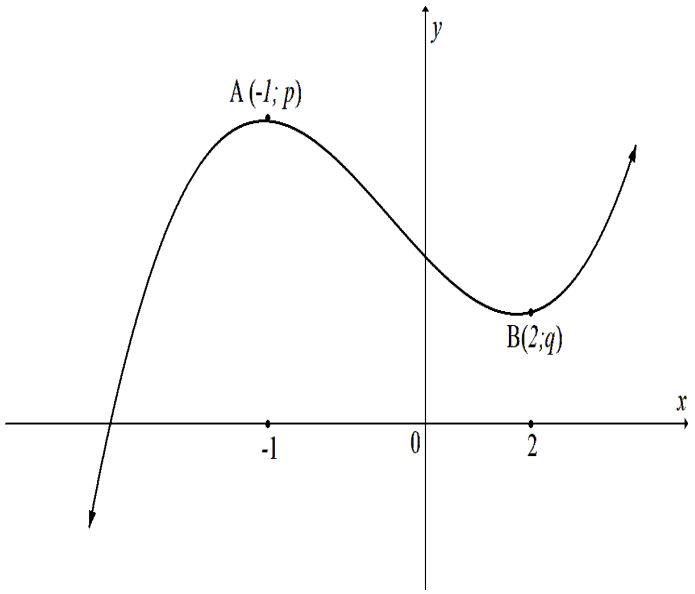
	7.2.3	$P_v = \frac{x[1-(1+i)^{-n}]}{i}$ $800\,000 = \frac{12\,000\left[1-\left(1+\frac{0,11}{12}\right)^{-n}\right]}{\frac{0,11}{12}}$ $n = \frac{\log\left(1-\frac{800\,000\times\frac{0,11}{12}}{12\,000}\right)}{-\log\left(1+\frac{0,11}{12}\right)}$ $n = 103,5$ Period / *Periode* $= 104$ months / *maande* In years / *In jare* $= \frac{104}{12} \approx 9$ years / *jare*	✓ substitution P_v/*verv* P_v ✓substitution/*vervanging* ✓correct use of logs/ *korrekte gebruik van logs* ✓value of *n*/*waarde van n* ✓answer/*antwoord*	(5)
				[15]

QUESTION 8/*VRAAG 8*

8.1	$f(x)=-x^2+3x$ $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $f'(x)=\lim_{h\to 0}\frac{-(x+h)^2+3(x+h)-(-x^2+3x)}{h}$ $f'(x)=\lim_{h\to 0}\frac{-x^2-2xh-h^2+3x+3h+x^2-3x}{h}$ $f'(x)=\lim_{h\to 0}\frac{h(-2x-h+3)}{h}$ $f'(x)=\lim_{h\to 0}(-2x-h+3)$ $f'(x)=-2x+3$ **OR** $f(x)=-x^2+3x$ $f(x+h)=-(x+h)^2+3(x+h)$ $=-x^2-2xh-h^2+3x+3h$ $f(x+h)-f(x)=-x^2-2xh-h^2+3x+3h+x^2-3x$ $=-2xh-h^2+3h)$ $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $f'(x)=\lim_{h\to 0}\frac{h(-2x-h+3)}{h}$ $f'(x)=\lim_{h\to 0}(-2x-h+3)$ $f'(x)=-2x+3$		✓ $f(x+h)$ ✓ substitution/*vervanging* ✓simplification/*vereenvoudiging* ✓common factor/*gemeensk factor* ✓answer/*antwoord* ✓ $f(x+h)$ ✓ substitution/*vervanging* ✓simplification/*vereenvoudiging* ✓common factor/*gemeensk faktor* ✓answer/*antwoord*	(5)
8.2	8.2.1	$g(x)=x^2-2\sqrt{x}$ $g(x)=x^2-2x^{\frac{1}{2}}$ $g'(x)=2x-x^{-\frac{1}{2}}$	✓ $2x^{\frac{1}{2}}$ ✓ $2x$ ✓ $x^{-\frac{1}{2}}$	(3)

	8.2.2	$y=\left[\frac{x^3-2x^2-x+2}{x-1}\right]$ $y=\left[\frac{(x-1)(x^2-x-2)}{x-1}\right]$ $y=x^2-x-2$ $\frac{dy}{dx}=2x-1$	✓factors/*faktore* ✓ $2x$ ✓ -1	(3)
				[11]

QUESTION 9/*VRAAG 9*

9.1		✓shape/*vorm* ✓ $A(-1\ ;\ p)$ ✓ $B\ (2\ ;\ q)$	(3)
9.2	One root/*Een wortel*	✓answer/*antwoord*	(1)

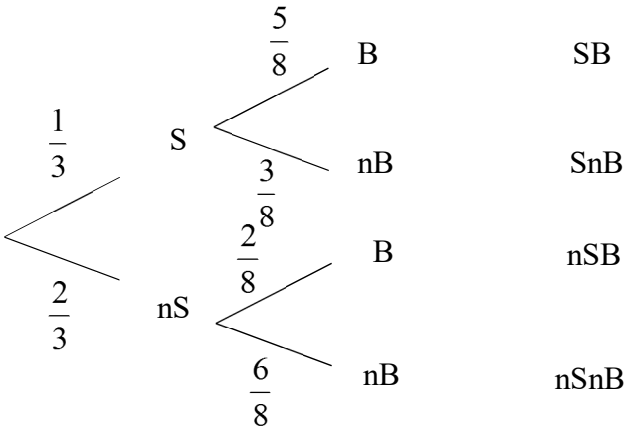
9.3	$f'(x) = 3x^2 + 2xb + c$ $f'(x) = 0$ $3(-1)^2 + 2b(-1) + c = 0$ $3 - 2b + c = 0$ $c = 2b - 3$ .....(1) $f'(2) = 0$ $3(2)^2 + 2b(2) + c = 0$ $12 + 4b + c = 0$ $c = -4b - 12$.....(2) $2b - 3 = -4b - 12$ $6b = -9$ $b = -\frac{3}{2}$ $c = -4\left(-\frac{3}{2}\right) - 12$ $\therefore c = -6$	✓ $3x^2 + 2xb + c$ ✓ $c = 2b - 3$ ✓ $c = -4b - 12$ ✓ $2b - 3 = -4b - 12$ ✓ $b = -\frac{3}{2}$ ✓ $c = -6$	(6)
			[10]

QUESTION 10/*VRAAG 10*

10.1	10.1.1	$p\left(x\ ;\ \sqrt{-x^3+8}\right)$ $OP^2=(x_2-x_1)^2+(y_2-y_1)^2$ $=(x)^2+\left(\sqrt{-x^3+8}\right)^2$ $=-x^3+x^2+8$ $OP=\sqrt{-x^3+x^2+8}$	✓substitution/*vervanging* ✓answer/*antwoord*	(2)
	10.1.2	For max / min values $f'(x)=0$ *Vir min / maks waardes* $f'(x)=0$ $-3x^2+2x=0$ $x(-3x+2)=0$ $x=0$ or / *of* $x=\frac{2}{3}$ subst / *verv* $x=0$ $y=8$ subst / *verv* $x=\frac{2}{3}$ $y=-\left(\frac{2}{3}\right)^3+\left(\frac{2}{3}\right)^2$ $=8{,}15$ The maximum of OP^2 is 8,15 / *Die maksimum van* OP^2 *is 8,15*	✓ $f'(x)=0$ ✓both values of *x/beide waardes van x* ✓value of *y* when $x=0$ / *waarde van y as* $x=0$ ✓value of *y* when $x=\frac{2}{3}$ */waarde van x as* $x=\frac{2}{3}$ ✓ max value/*maks waarde*	(5)
	10.1.3	The y – intercept of the graph is $2\sqrt{2}$ and the *x* – intercept is 2. The minimum value is $(2\ ;\ 0)$ */Die y – afsnit van die grafiek is* $2\sqrt{2}$ *en die x – afsnit is 2. Die minimum waarde is* $(2\ ;\ 0)$. $OP^2=-x^3+x^2+8$ $=-(2)^3+(2)^2+8$ $=4$ $OP=\sqrt{4}=2$	✓substitution/*vervanging* ✓answer/*antwoord*	(2)

10.2	10.2.1	$A=\frac{1}{2}(PQ+RS)(QR)$ $A(x)=\frac{1}{2}(2x-3+4x+3)(5-x)$ $=\frac{1}{2}(6x)(5-x)$ $=15x-3x^2$	✓substitution/*vervanging* ✓simplification/*vereenvoudig*	(2)
	10.2.2	$A'(x)=0$ $15-6x=0$ $6x=15$ $x=2.5\ m$	✓derivative = 0/*afgeleide = 0* ✓answer/*antwoord*	(2)
	10.2.3	Maximum Area / *Maksimum Opv* $=15(2.5)-3(2.5)^2$ $=18.75\ m^2$	✓substitution/*vervanging* ✓answer/*antwoord*	(2)
				[15]

QUESTION 11/*VRAAG 11*

11.1	11.1.1	$a = 720$ $b = 120$ $c = 180$ $d = 540$ $e = 180$ $f = 240$	✓any two/*enige twee* ✓ any two/*enige twee* ✓ any two/*enige twee*	(3)
	11.1.2	P(Good Eng) × P(Good Maths) $= \frac{480}{720} \times \frac{540}{720}$ $= 0,5$ P(Good English and Good Maths) $= \frac{360}{720}$ $= 0,5$ So it seems that the good English is independent of maths ability / *Dit lyk dat goeie Engels onafhanklik is van wiskundige vaardigheid*	✓ $\frac{480}{720} \times \frac{540}{720}$ ✓answer/*antwoord* ✓ $\frac{360}{720}$ ✓answer/*antwoord*	(4)
11.2	B → Beach/*strand* S → Sunny/*sonnig*  		

	$P(SB)+P(nSB)$ $=\left(\frac{1}{3}\times\frac{5}{8}\right)+\left(\frac{2}{3}\times\frac{2}{8}\right)$ $=\frac{5}{24}+\frac{4}{24}$ $=\frac{9}{24}$		✓$\left(\frac{1}{3}\times\frac{5}{8}\right)$ ✓$\left(\frac{2}{3}\times\frac{2}{8}\right)$ ✓answer/*antwoord*	(3)
11.3	11.3.1	$P=\frac{4\times3\times2\times24}{5040}$ $=\frac{576}{5040}=\frac{4}{35}$	✓ $7!=5040$ ✓ $4\times3\times2\times24=576$ ✓ answer/*antwoord*	(3)
	11.3.2	$P=\frac{6\times4\times24}{5040}$ $=\frac{576}{5040}=\frac{4}{35}$ Both events have the **same probability**/*Beide gebeurtenisse het* ***dieselfde waarskynlikheid***	✓ $6\times4\times24=576$ ✓ answer/*antwoord* ✓conclusion/*gevolgtrekking*	(3)
				[16]

TOTAL/ *TOTAAL*: 150

education
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE NASIONALE SENIOR SERTIFIKAAT

GRADE 12/GRAAD 12

MATHEMATICS P1/WISKUNDE V1

SEPTEMBER 2026

MARKING GUIDELINE/NASIENRIGLYNE

MARKS/PUNTE: 150

The marking guideline consists of 10 pages/Die nasienriglyn bestaan uit 10 bladsye.

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TAKE NOTE:

- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking guidelines.
- Assuming values/answers in order to solve a problem is unacceptable.

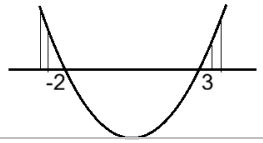
LET WEL:

- *As 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord deurgehaal en nie oorgedoen het nie, sien die deurgehaalde antwoord na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die nasienriglyn van toepassing.*
- *Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.*

QUESTION 1/VRAAG 1

1.1.1	$(2x+5)(x-1)=0$ $x=-\frac{5}{2}$ or $x=1$	✓✓ answers	(2)
1.1.2	$-3x^2-4x+5=0$ $x=\frac{-(-4)\pm\sqrt{(-4)^2-4(-3)(5)}}{2(-3)}$ $x=-2{,}12$ and $x=0{,}79$	✓standard form ✓substitution ✓✓answers	(4)
1.1.3	$3^{2x}-3^x-6=0$ $(3^x-3)(3^x+2)=0$ $(3^x-3)=0$ or $(3^x+2)=0$ $3^x=3$ or $3^x\neq -2$ $x=1$ No Sol **OR/OF** Let $3^x=k$ $k^x-k-6=0$ $(k-3)(k+2)=0$ $k=3$ *or* $k=-2$ $3^x=3$ *or* $3^x\neq -2$ $\therefore x=1$	✓breaking to prime factors ✓factoring ✓✓ solutions with rejection	(4)
1.1.4	$(2^5)^{\frac{1}{3}}=(2^3)^{3x}.2^{6x}$ $2^{\frac{5}{3}}=2^{9x}.2^{6x}$	✓ exponential form	

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	$2^{\frac{5}{3}} = 2^{15x}$ $\frac{5}{3} = 15x$ $x = \frac{1}{9}$	✓ adding exponents ✓ answer (3)
1.1.5	$-(x+2)(x-3) \leq 0$ $x = -2$ and $x = 3$ are critical values $x \leq -2$ or $x \geq 3$ 	✓critical values ✓✓ $x \leq -2$ or $x \geq 3$ (3)
1.2	$y = 2 + x$ $2 + x - 2 = (x-2)^2$ $2 + x - 2 = (x^2 - 4x + 4)$ $x = x^2 - 4x + 4$ $x^2 - 5x + 4 = 0$ $(x-1)(x-4) = 0$ $x = 1$ or $x = 4$ $y = 4 + 2$ or $y = 1 + 2$ $y = 6$ or $y = 3$	✓ $y = 2 + x$ ✓substitution ✓factors ✓both values of x ✓both values of y (5)
1.3	$3x^2 + (2k-2)x - k = 0$ $\Delta = b^2 - 4ac$ $= (2k-2)^2 - 4(3)(-k)$ $= 4k^2 + 4k + 4$ $k = \frac{-4 \pm \sqrt{(4)^2 - 4(4)(4)}}{2(4)}$ produces non-real solutions $\therefore$ There's no real value of k for which the discriminant can be equal to zero. Roots are non-real and are never equal.	✓substitution ✓ $= 4k^2 + 4k + 4$ ✓ $k = \frac{-4 \pm \sqrt{(4)^2 - 4(4)(4)}}{2(4)}$ ✓ mathematical rational (4)
1.4	$\frac{5^{2006} - 5^{2004} + 24}{5^{2004} + 1}$ $= \frac{5^{2004}(5^2 - 1) + 24}{5^{2004} + 1}$ $= \frac{5^{2004}(24) + 24}{5^{2004} + 1}$ $= \frac{24(5^{2004} + 1)}{5^{2004} + 1}$ $= 24$	✓ common factor/ gemeenskaplike faktor ✓ common factor/ gemeenskaplike faktor ✓ answer/ antwoord (3)
		[28]

QUESTION 2/VRAAG 2

2.1.1	14	✓ answer (1)
2.1.2	$T_n = a + d(n-1)$ $= -2 + 4(n-1)$ $= 4n - 6$	✓substitution ✓answer (2)
2.1.3	$262 = 4n - 6$ $n = 67$ $S_n = \frac{67}{2}[2(-2) + 4(67-1)]$ $= 8\,710$	✓equating to 262 ✓*n*-value ✓substitution ✓answer (4)
2.2.1	m 5 n 19 $5-m$ $n-5$ $19-n$ $n+m-10=2$ $-2n+24=2$ $\therefore n = 11$ $m = 12-11 = 1$	✓second difference ✓equating to 2 ✓*n*-value ✓*m*- value (4)
2.2.2	1 5 11 19 4 6 8 2 2 $2a = 2$ $3a + b = 4$ $a + b + c = 1$ $a = 1$ $b = 1$ $c = -1$ $\therefore T_n = n^2 + n - 1$	✓value of **a and b** ✓value of c ✓$T_n = n^2 + n - 1$ (3)
		[14]

QUESTION 3/VRAAG 3

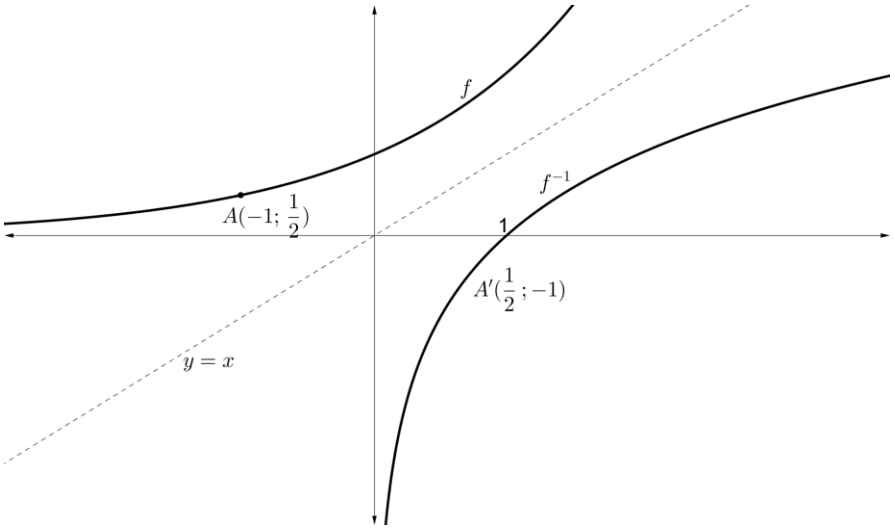
3.1.1	$r = -2$	✓ answer (1)
3.1.2	No, for convergence $-1 < r < 1$, this is not the case here.	✓No ✓condition (2)
3.1.3	$n = 21 - 3 + 1 = 19$ $S_{19} = \frac{-8x\left[(-2)^{19} - 1\right]}{-2-1}$ $= -1398104\ x$	✓*n*- value ✓substitution ✓answer (3)
3.2.1	*TERM* / *INCOME* / *EXPENSES* / *SAVINGS* 1 / *R*150 000 / *R*105 000 / *R*45 000 2 / *R*1635 00 / *R*122 000 / *R*41500 3 / *R*177 000 / *R*139 000 / *R*38 000 Savings series is $R45\,000 + R41500 + R38\,000 = \ldots + 0$	✓income ✓expenses ✓savings ✓savings series (4)
3.2.2	Income $= 150\,000 + 13\,000(n-1)$ Expenses $= 105\,000 + 17\,000(n-1)$ To be left with nothing means INCOME = EXPENSES $150\,000 + 13\,000(n-1) = 105\,000 + 17\,000(n-1)$ $\therefore n = 13{,}85 / n = 14$ years **OR/OF** $0 = 45\,000 - 3500(n-1)$ $\frac{45000}{3500} = n-1$ $\therefore n = 13{,}85 / n = 14$ years	✓Income and Expenses formulae ✓ equating ✓ answer **OR/OF** ✓ equation ✓ simplification ✓ answer (3)
		[13]

QUESTION 4/VRAAG 4

4.1	$y = \frac{a}{x-1} + 2$ $0 = \frac{a}{0-1} + 2\ \ 0 = -a + 2$ $a = 2$ $y = \frac{2}{x-1} + 2$	✓substitution of asymptotes ✓substituting a point (0; 0) ✓value of *a* ✓ equation (4)
4.2	$0 = \left(\frac{5}{2} - 1\right)^2 + q$ $q = -\frac{9}{4}$	✓substitution of *x* and *y* ✓ *q*- value (2)

4.3	$x = 2$ $y = -1$	✓ $x = 2$ ✓ $y = -1$ (2)
4.4	$L\left(-\frac{1}{2};0\right)$, Symmetry $LQ = \frac{5}{2} - \left(-\frac{1}{2}\right) = 3 units$	✓ x-coordinate of L ✓length (2)
4.5	$h(x) = -(x-1)^2 + \frac{9}{4}$	✓answer (1)
4.6	$x \in (-\infty;0) \cup (1;\infty)$ OR /OF $x < 0 \text{ or } x > 1$	✓1st Interval ✓2nd Interval (2)
		[13]

QUESTION 5/VRAAG 5

5.1	$x = 2^y$ $\therefore y = \log_2 x$	✓interchanging x & y ✓answer (2)
5.2	$A'\left(\frac{1}{2};-1\right)$	✓ answer
5.3		✓shape ✓ x – intercept ✓ symmetry – axis ✓ another point (4)
5.4	$2^x = \left(\frac{1}{2}\right)^{x-1}$ $2^x = 2^{-x+1}$ $x = -x + 1$ $x = \frac{1}{2};\ y = \sqrt{2}$	✓ equating ✓ exponential laws ✓ x - coordinate ✓ y - coordinate (4)
		[11]

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QUESTION 6/VRAAG 6

6.1.1	$A = P(1+in)$ $x = R15000(1+0,075\times 5)$ $x = R20625$	✓substitution into linear formula ✓answer (2)
6.1.2	$A = P(1+i)^n$ $R20625 = R10000(1+i)^5$ $\frac{R20625}{R10000} = (1+i)^5$ $\sqrt[5]{\frac{R20625}{R10000}} - 1 = i$ $\therefore i = 15,58\%$	✓ substitution of A and P ✓n =5 ✓simplification ✓answer (4)
6.2.1	$R20625 \times 2 = R41250$	✓ answer (1)
6.2.2	$R70000 - R41250 = R28750$	✓ answer (1)
6.2.3	$R28750 = \frac{x\left[\left(1+\frac{0,11}{12}\right)^{5\times 12} - 1\right]}{\frac{0,11}{12}}$ $x = R361.55$	✓substitution into F correctly ✓$i = \frac{0,11}{12}$ ✓$n = 60$ ✓answer (4)
6.3.	$OB = \frac{588,32\left[1-\left(1+\frac{0,13}{12}\right)^{-1,5\times 12}\right]}{\frac{0,13}{12}}$ $OB = R9574,34$ OR $OB = 15000\left(1+\frac{0,13}{12}\right)^{12} - \frac{588,32\left[\left(1+\frac{0,13}{12}\right)^{12} - 1\right]}{\frac{0,13}{12}}$ $OB = R9574,34$	✓substitution ✓ $n = 18$ ✓ answer (3) OR/OF ✓ substitution ✓$n = 12$ ✓answer (3)
		[15]

QUESTION 7/VRAAG 7

7.1	$f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)\ -f(x)}{h}$ $=\lim\limits_{h\to 0}\dfrac{-\pi(x+h)^2-\left(-\pi x^2\right)}{h}$ $=\lim\limits_{h\to 0}\dfrac{-\pi\left(x^2+2xh+h^2\right)+\pi x^2}{h}$ $=\lim\limits_{h\to 0}\dfrac{-\pi x^2-2\pi xh-\pi h^2+\pi x^2}{h}$ $=\lim\limits_{h\to 0}\dfrac{-2\pi xh-\pi h^2}{h}$ $=\lim\limits_{h\to 0}\dfrac{h(-2\pi x-\pi h)}{h}$ $=\lim\limits_{h\to 0}-2\pi x-\pi h$ $=\ -2\pi x$	✓ substitute $f(x+h)$ ✓ correct substitution into formula and notation ✓ simplification ✓ factorisation ✓ answer (5)
7.2	$y=\left(1-\sqrt{x}\right)\left(1-\sqrt{x}\right)$ $=1-2\sqrt{x}+x$ $=1-2x^{\frac{1}{2}}+x$ $\dfrac{dy}{dx}=-x^{-\frac{1}{2}}+1$	✓expansion ✓writing in exponent form ✓ answer (3)
7.3	$g(x)=\dfrac{x\left(x^2-100\right)-x^2+100}{x-1}$ $=\dfrac{x(x^2-100)-(x^2-100)}{x-1}$ $=\dfrac{(x-1)\left(x^2-100\right)}{x-1}$ $=x^2-100$ $g'(x)=2x$	✓common negative ✓taking out common bracket ✓ simplification ✓ answer (4)
7.4	$h(x)=7-2x^{-3}$ $h'(x)=6x^{-4}$ $h'(2)+4=6(2)^{-4}+4$ $=\dfrac{35}{8}$	✓$h'(x)=6x^{-4}$ ✓substitution ✓answer (3)
		[15]

QUESTION 8/VRAAG 8

8.1	$y = a(x - R_1)(x - R_2)(x - R_3)$ $y = -1(x+1)^2(x-2)$ $= -x^3 + 3x + 2$	✓ $a = -1$ ✓ $y = -1(x+1)^2(x-2)$ ✓ expansion (3)
8.2	$f'(x) = 0$ $f'(x) = -3x^2 + 3$ $3x^2 = 3$ $x = \pm 1$ $f(1) = -(1)^3 + 3(1) + 2 = 4$ $C(1;\ 4)$	✓ $f'(x) = 0$ ✓ $f'(x) = -3x^2 + 3$ ✓ x-values ✓ coordinates of C (4)
8.3	$-3x^2 + 3 = -9$ $-3x^2 = -12$ $x = \pm 2$ $-(2)^3 + 3(2) + 2 = 0$ $\therefore (2\ ;\ 0)$ is the point of tangency	✓ $f'(x) = -9$ ✓ substitution of 2 ✓ answer (3)
8.4	$C'(4\ ;\ 4)$	✓answer (1)
8.5	$x \in (-\infty;-1) \cup (1;2)$ **OR** $x < -1$ *or* $1 < x < 2$	✓1st interval ✓ 2nd interval (2)
8.6	$k \in (-\infty;0) \cup (4;\infty)$ **OR** $x < 0$ *or* $x > 4$	✓1st interval ✓ 2nd interval (2)
		[15]

QUESTION 9/*VRAAG 9*

9.1	After t hours, $BF = 20t$ and $CD = 35t$ $\therefore BC = 80 - 35t$ $FC = \sqrt{(20t)^2 + (80 - 35t)^2}$ $= \sqrt{400t^2 + 6400 - 5600t + 1225t^2}$ $= \sqrt{1625t^2 - 5600t + 6400}$	✓ $BF = 20t$ and $CD = 35t$ ✓ $BC = 80 - 35t$ ✓substitution ✓simplification (4)

9.2	**Closest** means minimum distance between the two. FC is minimum if FC^2 is minimum. $FC^2 = 1625t^2 - 5600t + 640$ $\frac{dFC^2}{dt} = 3250t - 5600$ $3250t - 5600 = 0$,for minimum distance $\therefore t = \frac{5600}{3250} = 1{,}72hrs$	✓ $FC^2 = 1625t^2 - 5600t + 640$ ✓ $\frac{dFC^2}{dt}$ ✓equating to 0 ✓answer (4)
9.3	$FC = \sqrt{1625(1.72)^2 - 5600(1.72) + 6400}$ $= 39{,}69km$ apart	✓substitution ✓answer (2)
		[10]

QUESTION 10/*VRAAG 10*

10.1	$P(A\,or\,B) = P(A) + P(B) - P(A\,and\,B)$ $0{,}7 = 0{,}4 + k - P(A\,and\,B)$ $\therefore P(A\,and\,B) = k - 0{,}3$ For independent events: $P(A\,and\,B) = P(A) \times P(B)$ $k - 0{,}3 = 0{,}4 \times k$ $k = 0{,}5$	✓ substitution into addition rule ✓ $P(A\,and\,B) = k - 0{,}3$ ✓ substitution into $P(A\,and\,B) = P(A) \times P(B)$ ✓ answer (4)
10.2.1	$7! = 5040$	✓ 7! ✓answer (2)
10.2.2	$3! \times 5! = 720$	✓3! ✓5! ✓ 720 (3)
10.3.1	$\underline{\mathbf{3}} \times \mathbf{9} \times \mathbf{9} \times \underline{\mathbf{4}} = 972$	✓ $\underline{\mathbf{3}}$ in first position ✓$\underline{\mathbf{4}}$ in last position ✓ $\mathbf{9} \times \mathbf{9}$ (3)
10.3.2	$9 \times \mathbf{9} \times \mathbf{9} \times \mathbf{9} = 6561$ Total sample space) $9 \times \mathbf{9} \times \mathbf{9} \times 1 = 729$ (number of passwords divisible by 5) P(Multiple of 5) = $\frac{729}{6561} = 0.11$	✓ total sample space ✓ number of passwords divisible by 5 ✓✓answer (4)
		[16]

TOTAL / TOTAAL: 150

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Northern Cape
Department of Education

PROVINCIAL PREPARATORY EXAMINATION/
PROVINSIALE VOORBEREIDENDE EKSAMEN

GRADE/*GRAAD* 12

MATHEMATICS/*WISKUNDE*

PAPER/*VRAESTEL* 1

SEPTEMBER 2026

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 20 pages./
Hierdie nasienriglyne bestaan uit 20 bladsye.

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MARKING CODES/*NASIENKODES*	
A	Accuracy/*Akkuraatheid*
CA	Consistent accuracy/*Volgehoue akkuraatheid*
M	Method/*Metode*
R	Rounding/*Afronding*
NPR	No penalty for rounding/*Geen penalisering vir afronding nie*
NPU	No penalty for units omitted/*Geen penalisering vir eenhede weggelaat nie*
S	Simplification/*Vereenvoudiging*
SF	Substitution in correct formula/*Vervanging in korrekte formule*

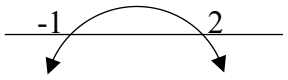
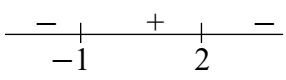
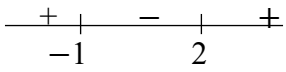
NOTE

- If a learner answers a question TWICE, only mark the FIRST attempt.
- If a learner has crossed out an attempt to answer a question but did not redo it, mark the crossed-out version
- Consistent accuracy applies in ALL aspects of the marking guidelines.
- Assuming answers/values to solve a problem is UNACCEPTABLE.

NOTA

- *As 'n leerder 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.*
- *As 'n leerder n antwoord van 'n vraag doodtrek en nie oordoen nie, sien die doodtrekte poging na.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die nasienriglyne toegepas.*
- *Om antwoorde/waardes aan te neem om 'n problem op te los, is OnAANVAARBAAR.*

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QUESTION 1/*VRAAG 1*		
1.1.1	$2x(x-2)=0$ $2x=0$ **OR/*OF*** $x-2=0$ $x=0$ $x=2$	✓ $x=0$ ✓ $x=2$ (2)
1.1.2	$-x^2+7x+5=0$ $x=\frac{-7\pm\sqrt{7^2-4(-1)(5)}}{2(-1)}$ $x=-0{,}65$ or/*of* $x=7{,}65$ **OR/*OF*** $0=x^2-7x-5$ $x=\frac{-(-7)\pm\sqrt{(-7)^2-4(1)(-5)}}{2(1)}$ $x=-0{,}65$ or/*of* $x=7{,}65$	✓standard form ✓SF ✓ $x=-0{,}65$ ✓ $x=7{,}65$ **OR/*OR*** ✓✓✓✓**AO** (4)
1.1.3	$(x+1)(2-x)<0$ CV: $x=-1$ or $x=2$  $x<-1$ or/*of* $x>2$ **OR/*OF***  $x<-1$ or/*of* $x>2$ **OR/*OF*** $-(x+1)(x-2)<0$ $(x+1)(x-2)>0$ CV: $x=-1$ or/*of* $x=2$  $x<-1$ or/*of* $x>2$ **OR/*OF***  $x<-1$ or/*of* $x>2$	✓critical value ✓✓answer **OR/*OF*** ✓critical values ✓✓answer (3)
1.1.4	$\sqrt{x-3}=\frac{x}{2}-1$ $\left(\sqrt{x-3}\right)^2=\left(\frac{x}{2}-1\right)^2$ $x-3=\frac{x^2}{4}-x+1$ $4x-12=x^2-4x+4$ $0=x^2-8x+16$ $0=(x-4)(x-4)$ $\therefore x=4$ **OR/*OF*** $x=4$	✓isolate the surd ✓squaring both sides ✓standard form ✓answer (4)

1.2	$y - x^2 = -3x + 2$ …(1) and/*en* $y = 2x - 4$ …(2) (2) into (1) $(2x - 4) - x^2 = -3x + 2$ $-x^2 + 2x - 4 = -3x + 2$ $-x^2 + 5x - 6 = 0$ $x^2 - 5x + 6 = 0$ $(x - 2)(x - 3) = 0$ $\therefore x = 2$ **OR/*OF*** $x = 3$ $y = 2(2) - 4$ **OR/*OF*** $y = 2(3) - 4$ $y = 0$ $y = 2$ **OR/*OF*** $y = -3x + 2 + x^2$ …(1) and/*en* $y = 2x - 4$ …(2) (2) into (1) $-3x + 2 + x^2 = 2x - 4$ $x^2 - 3x - 2x + 4 + 2 = 0$ $x^2 - 5x + 6 = 0$ $x^2 - 5x + 6 = 0$ $(x - 2)(x - 3) = 0$ $\therefore x = 2$ **OR/*OF*** $x = 3$ $y = 2(2) - 4$ **OR/*OF*** $y = 2(3) - 4$ $y = 0$ $y = 2$	✓substitution ✓standard form ✓factors ✓BOTH x-values ✓BOTH y-values **OR/*OF*** ✓substitution ✓standard form ✓factors ✓BOTH x-values ✓BOTH y-values (5)

1.3	$b^2 - 4ac = 0$ $(-m)^2 - 4(2)(2) = 0$ $m^2 - 16 = 0$ $m = \pm 4$	✓$m = \pm 4$
	The equal root is $x = \frac{-b}{2a} = \frac{m}{4}$	✓$x = \frac{m}{4}$
	$x^2 - (m-2)x + k = 0$ has equal roots that are **reciprocals** of the equal root.	✓ reciprocal $\frac{4}{m}$
	$\left(x - \frac{4}{m}\right)^2 = 0.$ $x^2 - \frac{8}{m}x + \frac{16}{m^2} = 0.$	✓expansion
	Comparing with $x^2 - (m-2)x + k = 0$	
	Hence $m - 2 = \frac{8}{m}$ and $k = \frac{16}{m^2}$	
	$m(m-2) = 8$ $m^2 - 2m - 8 = 0$ $(m-4)(m+2) = 0$ $m = 4$ or $m \neq -2$ since $m = \pm 4$ from the first eq.	✓equation ✓choose $m = 4$
	$k = \frac{16}{m^2} = \frac{16}{4^2} = \frac{16}{16} = 1.$	✓$k = 1$
	∴ m = 4, k = 1	(7)
		[25]

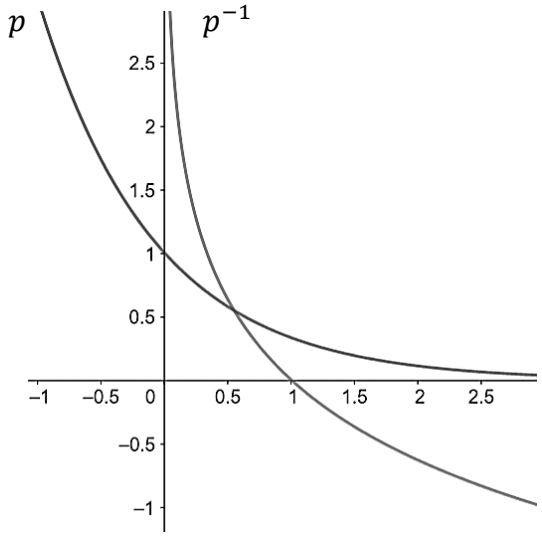
QUESTION 2/*VRAAG 2*		
2.1	$T_1 = 5$ Therefore, the next two terms are: $T_2 = T_1 + 6(1) + 2$ $T_2 = 5 + 8$ $T_2 = 13$ $T_3 = T_2 + 6(2) + 2$ $T_3 = 13 + 14$ $T_3 = 27$	✓ $T_2 = 13$ ✓ $T_3 = 27$ (2)
2.2	$2a = 6$ $a = 3$ $3a + b = 8$ $3(3) + b = 8$ $b = -1$ $a + b + c = 5$ $3 - 1 + c = 5$ $c = 3$ $\therefore T_n = 3n^2 - n + 3$	✓ $2a = 6$ ✓ $3(3) + b = 8$ ✓ $3 - 1 + c = 5$ (3)
2.3	$3n^2 - n + 3 = 2327$ $3n^2 - n - 2324 = 0$ $n = \frac{-(-1)+\sqrt{(-1)^2-4(3)(-2324)}}{2(3)}$ $n = 28$ **OR/*OF*** $n \neq -27{,}66$ $\therefore n = 29$	✓standard form ✓SF ✓ $n = 28$ ✓ $n = 29$ AO (4)
2.4	$6p + 2 = 902$ $6p = 900$ $p = 150$ Therefore, the consecutive terms are T_{150} and T_{151}	✓M ✓answer (2)
		[11]

QUESTION 3/*VRAAG 3*		
3.1.1	$r = \frac{6}{20} \times \frac{10}{6} = \frac{1}{2}$ $S_{18} = \frac{\frac{6}{10}\left(\left(\frac{1}{2}\right)^{18} - 1\right)}{\frac{1}{2} - 1}$ $= 1{,}20$ **OR/*OF*** $r = \frac{6}{20} \times \frac{10}{6} = \frac{1}{2}$ $S_{18} = \frac{\frac{6}{10}\left(1 - \left(\frac{1}{2}\right)^{18}\right)}{1 - \frac{1}{2}}$ $= 1{,}20$	✓ $r = \frac{1}{2}$ ✓SF ✓answer **OR/*OF*** ✓ $r = \frac{1}{2}$ ✓SF ✓answer (3)
3.1.2	$\frac{6}{10}\left(\frac{1}{2}\right)^{n-1} = \frac{6}{4096}$ $\left(\frac{1}{2}\right)^{n-1} = \frac{5}{2048}$ $n - 1 = \log_{\frac{1}{2}} \frac{5}{2048}$ $n = 9{,}67$ $\therefore n = 9$	✓Equation ✓S ✓log ✓ $n = 9$ (4)
3.2	$T_1 = 5\left(\frac{1}{3}\right)^1 = \frac{5}{3}$ $T_2 = 5\left(\frac{1}{3}\right)^2 = \frac{5}{9}$ $r = \frac{\frac{5}{9}}{\frac{5}{3}} = \frac{1}{3}$ $-1 < \frac{1}{3} < 1$ Therefore $T_n = 5\left(\frac{1}{3}\right)^n$ converges	✓$r = 1/3$ ✓$-1 < \frac{1}{3} < 1$ (2)

3.3	$\sum_{k=p}^{\infty} 5\left(\frac{1}{3}\right)^k = \frac{5}{18}$, $\frac{a}{1-\frac{1}{3}} = \frac{5}{18}$ $a = \frac{5}{18} \times \frac{2}{3}$ $a = \frac{5}{27}$ $5\left(\frac{1}{3}\right)^p = \frac{5}{27}$ $\left(\frac{1}{3}\right)^p = \left(\frac{1}{3}\right)^3$ **OR/*OF*** $p = \log_{\frac{1}{3}} \frac{1}{27}$ $\therefore p = 3$	✓SF ✓ $a = \frac{5}{27}$ ✓$T_1 = a$ ✓same base or log ✓ $p = 3$ (5)
		[14]

QUESTION 4/*VRAAG 4*		
4.1	$A(-1;0)$ $B(3;0)$	✓ $A(-1;0)$ ✓ $B(3;0)$ (2)
4.2	$y = x^2 - 2x - 3$ $x = -\frac{(-2)}{2(1)} = 1$ $y = 1^2 - 2(1) - 3 = -4$ $\therefore C(1;-4)$ **OR/*OF*** $y = x^2 - 2x - 3$ $= x^2 - 2x + \left(\frac{2}{2}\right)^2 - \left(\frac{2}{2}\right)^2 - 3$ $= x^2 - 2x + 1 - 1 - 3$ $= (x-1)^2 - 4$ $\therefore C(1;-4)$ **OR/*OF*** $y = x^2 - 2x - 3$ $0 = 2x - 2$ $x = \frac{2}{2}$ $x = 1$ $y = 1^2 - 2(1) - 3 = -4$ $\therefore C(1;-4)$ **OR/*OF*** $x = \frac{-1+3}{2}$ $= 1$ $y = (1+1)(1-3) = -4$ $\therefore$ C(1; –4)	✓Expansion ✓ $x = 1$ ✓$y = -4$ **OR/*OF*** ✓Completing the square ✓ $x = 1$ ✓$y = -4$ **OR/*OF*** ✓1st derivative =0 ✓ $x = 1$ ✓$y = -4$ **OR/*OF*** ✓Midpoint of roots ✓ $x = 1$ ✓$y = -4$ (3)
4.3	$p = 3$ Subst. $D\left(\frac{5}{2};0\right)$ $0 = -\frac{1}{\frac{5}{2}-3} + q$ $q = -2$ $\therefore f(x) = -\frac{1}{x-3} - 2$	✓ $p = 3$ ✓SF ✓ $q = -2$ (3)

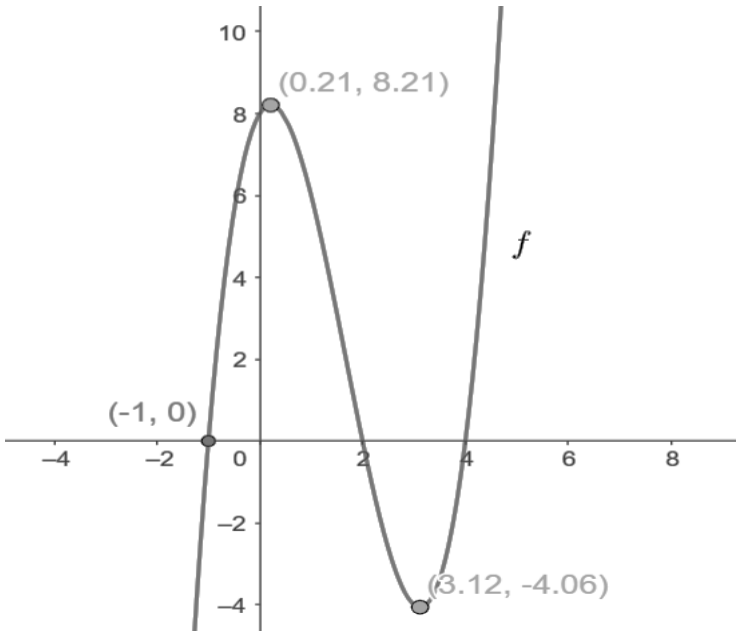
4.4	$y = -2$	✓ (1)
4.5	$x > 3$; $x \in \mathbb{R}$ **OR/*OF*** $x \in (3; \infty)$	✓✓ $x > 3$ (2)
4.6	$h(x) = g(x) - 5$ $= x^2 - 2x - 3 - 5$ $= x^2 - 2x - 8$	✓SF ✓answer (2)
4.7	$y = (1)^2 - 2(1) - 8 = -9$ $y \geq -9; y \in \mathbb{R}$ **OR/*OF*** $y \in [-9; \infty)$	✓ –9 ✓answer (2)
4.8	$EC = f(1) - g(1)$ $= (-\frac{1}{1-3} - 2) - (1+1)(1-3)$ $= -\frac{3}{2} - (-4)$ $= \frac{5}{2}$ units **OR/*OF*** $EC = \sqrt{(1-1)^2 + \left(-\frac{3}{2} - (-4)\right)^2} = \frac{5}{2}$ units	✓$f(1)$ ✓$g(1)$ ✓$\frac{5}{2}$ units **OR/*OF*** ✓✓SF ✓$\frac{5}{2}$ units (3)
4.9	$0 = x^2 - 2x - 8 - p$ $\Delta \geq 0$ $(-2)^2 - 4(1)(-8-p) \geq 0$ $4 + 32 + 4p \geq 0$ $p \geq -\frac{32}{4}$ $p \geq -9$	✓standard form ✓$\Delta \geq 0$ ✓$p \geq -9$ AO (3)
		[21]

QUESTION 5/VRAAG 5		
5.1	decreasing	✓answer (1)
5.2	$x = 3^{-y}$ $-y = \log_3 x$ $y = -\log_3 x$ **OR/*OF*** $x = \left(\frac{1}{3}\right)^y$ $y = \log_{\frac{1}{3}} x$	✓swop x and y ✓ $y = -\log_3 x$ **OR/*OF*** ✓swop x and y ✓ $y = \log_{\frac{1}{3}} x$ **OR/*OF*** ✓✓**AO** (2)
5.3	$m'\left(\frac{1}{9}; 2\right)$	✓answer (1)
5.4		p ✓y-intercept ✓shape p^{-1} ✓x-intercept ✓shape (4)
5.5	$x > 0; x \in \mathbb{R}$ **OR/*OF*** $x \epsilon (0; \infty)$	✓answer (1)
5.6	$y = -2$	✓answer (1)
5.7	p is reflected over the $y = x$ line to produce $y = p^{-1}$ p^{-1} is then reflected over $y = 0$ to produce $y = \log_3 x$ **OR/*OF*** p is then reflected over $x = 0$ to produce $y = 3^x$ p^{-1} is reflected over the $y = x$ line to produce $y = \log_3 x$	✓reflection on $y = x$ ✓reflection on $y = 0$ **OR/*OF*** ✓reflection on $x = 0$ ✓reflection on $y = x$ (2)
		[12]

QUESTION 6/*VRAAG 6*		
6.1.1	$A = P(1+i)^n$ $= 185\,000(1+0{,}062)^5$ $= R249\,916{,}14$	✓SF ✓answer (2)
6.1.2	$A = P(1-in)$ $= 185\,000\big(1-0{,}085(5)\big)$ $= R106\,375{,}00$	✓SF ✓answer (2)
6.1.3	sinking fund $= R249\,916{,}14 - R106\,375{,}00$ $= R143\,541{,}14$ $\frac{x\left(\left(1+\frac{0{,}081}{12}\right)^{5(12)-1}-1\right)}{\frac{0{,}081}{12}} = R143\,541{,}14$ $x = R1\,988{,}61$	✓sinking fund ✓i and n ✓SF ✓answer (4)
6.2.1	$\frac{x\left(1-\left(1+\frac{0{,}12}{12}\right)^{-(5(12))}\right)}{\frac{0{,}12}{12}} = R180\,000$ $x = R4\,004$	✓SF ✓answer (2)
6.2.2	$B = \frac{4004\left(1-\left(1+\frac{0{,}12}{12}\right)^{-(4(12))}\right)}{\frac{0{,}12}{12}}$ $B = R152\,047{,}73$ $A = P(1+i)^n$ $= 152\,036{,}34\left(1+\frac{0{,}12}{12}\right)^3$ $= R156\,654{,}93$ $\frac{x\left(1-\left(1+\frac{0{,}12}{12}\right)^{-45}\right)}{\frac{0{,}12}{12}} = R156\,654{,}93$ $x = R4\,340{,}13$ **OR/*OF*** $B = 180\,000\left(1+\frac{0{,}12}{12}\right)^{12} - 4004\left(\frac{\left(1+\frac{0{,}12}{12}\right)^{12}-1}{\frac{0{,}12}{12}}\right)$ $B = 152\,047{,}76$ $A = P(1+i)^n$ $= 152\,051{,}57\left(1+\frac{0{,}12}{12}\right)^3$ $\approx R156\,654{,}96$ $\frac{x\left(1-\left(1+\frac{0{,}12}{12}\right)^{-45}\right)}{\frac{0{,}12}{12}} = R156\,658{,}88$ $x = R4\,340{,}13$	✓i and n ✓SF ✓B ✓A ✓SF ✓x **OR/*OF*** ✓i and n ✓SF ✓B ✓A ✓SF ✓x (6)
		[16]

QUESTION 7/*VRAAG 7*		
NB penalise once for notation in 7.1 ONLY		
7.1	$f(x) = x^2 - 3x + 2$ $f(x+h) = (x+h)^2 - 3(x+h) + 2$ $= x^2 + 2xh + h^2 - 3x - 3h + 2$ $f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$ $f'(x) = \lim_{h\to 0} \frac{x^2+2xh+h^2-3x-3h+2-(x^2-3x+2)}{h}$ $f'(x) = \lim_{h\to 0} \frac{2xh+h^2-3h}{h}$ $f'(x) = \lim_{h\to 0} \frac{h(2x+h-3)}{h}$ $f'(x) = \lim_{h\to 0} 2x + h - 3$ $f'(x) = 2x - 3$	✓ $f(x+h)$ ✓SF ✓S $\lim_{h\to 0} \frac{2xh+h^2-3h}{h}$ ✓S $\lim_{h\to 0} \frac{h(2x+h-3)}{h}$ ✓S$\lim_{h\to 0} 2x + h - 3$ ✓$2x - 3$ (6)
7.2.1	$D_x[(2x+5)(x-2)]$ $= D_x[2x^2 + x - 10]$ $= 4x + 1$	✓S ✓$4x$ ✓1 (3)
7.2.2	$y = \frac{\sqrt[3]{x^4}}{x} + \frac{2\pi}{x} - \frac{x^{-3}}{x}$ $y = x^{\frac{1}{3}} + 2\pi x^{-1} - x^{-4}$ $\frac{dy}{dx} = \frac{1}{3}x^{\frac{-2}{3}} - 2\pi x^{-2} + 4x^{-5}$	✓S ✓$\frac{1}{3}x^{\frac{-2}{3}}$ ✓$-2\pi x^{-2}$ ✓$4x^{-5}$ (4)
7.3	$m_\perp = -2$ $y = 3(2-x)^2$ $= 3(4 - 4x + x^2)$ $= 12 - 12x + 3x^2$ $\frac{dy}{dx} = -12 + 6x$ $-2 = -12 + 6x$ $x = \frac{10}{6}$ $x = \frac{5}{3}$	✓$m_\perp = -2$ ✓S ✓derivative $= -2$ ✓answer (4)
		[17]

QUESTION 8/*VRAAG 8*		
8.1.1	$f(x) = (x+1)(x-2)(x+k)$ $\begin{array}{r} -1 \quad +6 \quad -8 \\ \underline{+1 \quad -5 \quad +2 \quad +8 \;\vert\; -1} \\ \mathbf{1 \quad -6 \quad +8 \quad 0} \end{array}$ $f(x) = (x+1)(x^2-6x+8)$ $\quad = (x+1)(x-2)(x-4)$ $\therefore k = -4$ **OR/*OF*** $(x^2-x-2)(x+k)$ $= x^3 + kx^2 - x^2 - kx - 2x - 2k$ $= x^3 + (k-1)x^2 - (k+2)x - 2k$ **Compare coefficients with** $x^3 - 5x^2 + 2x + 8$ $k - 1 = -5$ OR $-(k+2) = 2$ $k = -4$ $-k - 2 = 2$ $-k = 4$ $k = -4$ **OR/*OF*** $\begin{array}{r} x^2 - 6x \quad +8 \\ \hline x+1 \;\vert\; x^3 - 5x^2 + 2x + 8 \\ \underline{x^3 + \quad x^2} \quad \downarrow \\ -6x^2 + 2x \\ \underline{-6x^2 - 6x} \quad \downarrow \\ 8x \quad +8 \\ \underline{8x + 8} \\ 0 \end{array}$ $f(x) = (x+1)(x^2-6x+8)$ $\quad = (x+1)(x-2)(x-4)$ $\Rightarrow x + k = x - 4$ $\therefore k = -4$ **OR/*OF*** **By inspection** $(x+1(x-2)(x+k)$ $\Rightarrow (-1)(2)(-k) = -8$ $2k = -8$ $k = -4$	✓M ✓ $k = -4$ **OR/*OF*** ✓M ✓ $k = -4$ **OR/*OF*** ✓M ✓ $k = -4$ **OR/*OF*** ✓M ✓ $k = -4$ **OR/*OF*** ✓✓*AO* (2)

8.1.2	$f(x) = x^3 - 5x^2 + 2x + 8$ $f^{\prime}(x) = 3x^2 - 10x + 2$ $0 = 3x^2 - 10x + 2$ $x = \frac{-(-10) \pm \sqrt{(-10)^2 - 4(3)(2)}}{2(3)}$ $x = 3{,}12$ or/*of* $x = 0{,}21$ $y = (3{,}12)^3 - 5(3{,}12)^2 + 2(3{,}12) + 8 \approx -4{,}06$ $y = (0{,}21)^3 - 5(0{,}21)^2 + 7(0{,}21) + 8 = 8{,}21$ TPs: $(3{,}12; -4{,}06)$ and/*en* $(0{,}21; 8{,}21)$	✓$f^{\prime}(x) = 0$ ✓BOTH x-values ✓BOTH y-values (3)
8.2		✓intercepts ✓TPs ✓shape (3)
8.3	Point of inflection $f^{\prime}(x) = 3x^2 - 10x + 2$ $f^{\prime\prime}(x) = 6x - 10$ $0 = 6x - 10$ $x = \frac{10}{6}$ $x = \frac{5}{3}$ Concave down: $x < \frac{5}{3}$ **OR/*OF*** $x = \frac{0.21 + 3.12}{2}$ $x = 1{,}67$ Concave down: $x < 1{,}67$	✓ M ✓ answer **OR/*OF*** ✓ M ✓ answer **OR/*OF*** ✓✓AO (2)

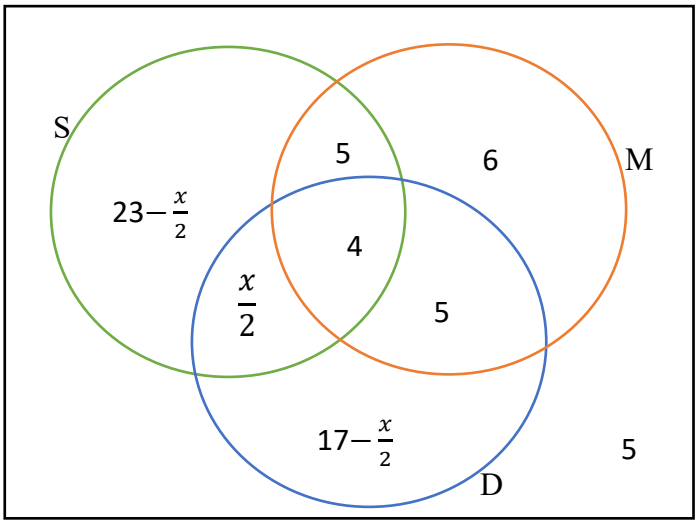
8.4	$0 < x < 0{,}21$ or $x > 3{,}12$ **OR/*OF*** $x \in (0; 0{,}21)$ or/*of* $(3{,}12; \infty)$	✓$0 < x < 0{,}21$ ✓ $x > 3{,}12$ (2)
		[12]

QUESTION 9/ *VRAAG 9*		
9.1	Length parallel to wall $= -2x + 60$ $A = x(-2x + 60)$ $A = -2x^2 + 60x$	✓ $x(-2x + 60)$ (1)
9.2	$A = -2x^2 + 60x$ $A'(x) = -4x + 60$ $0 = -4x + 60$ $4x = 60$ $x = 15$ $A(15) = 60(15) - 2(15)^2$ $= 900 - 450$ $= 450\ m^2$ **OR/*OF*** $x = -\frac{b}{2a}$ $= -\frac{60}{2(-2)}$ $= 15$ $A(15) = 60(15) - 2(15)^2$ $= 900 - 450$ $= 450\ m^2$	✓$-4x + 60 = 0$ ✓$x = 15$ ✓$450\ m^2$ **OR/*OF*** ✓SF ✓$x = 15$ ✓$450\ m^2$ (3)

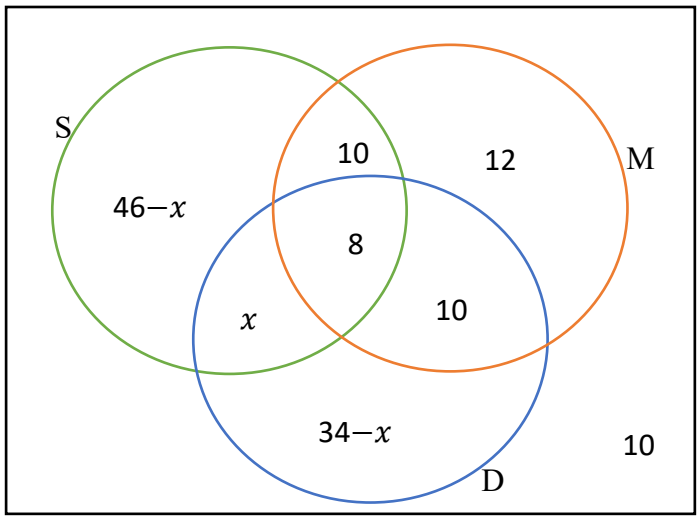
9.3	$5(2x) + 8y = 480$ $10x + 8y = 480$ $y = \frac{480-10x}{8}$ $A(x) = x \cdot y$ $A(x) = x\left(\frac{480-10x}{8}\right)$ $A(x) = 60x - \frac{5}{4}x^2$ $A'(x) = 60 - \frac{5}{2}x$ $0 = 60 - \frac{5}{2}x$ $x = 24$ **OR/*OF*** $5(2x) + 8y = 480$ $10x + 8y = 480$ $x = \frac{480-8y}{10}$ $A(x) = x \cdot y$ $A(x) = \left(\frac{480-8y}{10}\right) \cdot y$ $A(x) = 48y - \frac{4}{5}y^2$ $A'(x) = 48 - \frac{8}{5}y$ $0 = 48 - \frac{8}{5}y$ $y = 30$ $x = \frac{480-8(30)}{10}$ $x = 24$	✓cost equation ✓$y = \frac{480-10x}{8}$ ✓SF ✓$\frac{dA}{dx} = 0$ ✓ $x = 24$ **OR/*OF*** ✓cost equation ✓$x = \frac{480-8y}{10}$ ✓SF ✓$\frac{dA}{dx} = 0$ ✓$x = 24$ (5)
		[9]

QUESTION 10/ *VRAAG 10*

10.1.1



OR/*OF*



✓$23-\frac{x}{2}$ and 5

✓$\frac{x}{2}$ and 4

✓$17-\frac{x}{2}$ and 5

✓6 and 5

OR/*OF*

✓$46-x$ and 10

✓x and 8

✓$34-x$ and 10

✓12 and 10

*Accept decimal input

(4)

10.1.2

$50 = \frac{x}{2} + 23 - \frac{x}{2} + 5 + 4 + 17 - \frac{x}{2} + 5 + 6 + 5$

$\frac{x}{2} = 65 - 50$

$x = 30\%$

OR/*OF*

$100 = x + 46 - x + 10 + 8 + 34 - x + 10 + 12 + 10$

$x = 130 - 100$

$x = 30\%$

✓ $x = 30\%$

OR/*OF*

✓ $x = 30\%$

*Accept decimal

(1)

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10.1.3	Two events are independent if $P(S \cap M) = P(S)\,P(M)$ $P(S \cap M) = 18\% = 0{,}18$ $P(S)P(M) = 0{,}64 \times 0{,}40 = 0{,}256$ Since $0{,}18 \neq 0{,}256$, ∴ Sports and Music are NOT independent.	✓M ✓answer (2)
10.2 English	**Total possible arrangements** Letter counts: • $S = 3$ • $T = 3$ • $I = 2$ • $A = 1$ • $C = 1$ Total letters $= 10$ $\quad N(S) = \frac{10!}{3!3!2!}$ **Arrangements that end with S** Remaining letters: • $S = 2$ • $T = 3$ • $I = 2$ • $A = 1$ • $C = 1$ Total remaining letters $= 9$ $\quad \mathrm{N(E)} = \frac{9!}{2!3!2!}$ $P(E) = \frac{\mathrm{N(E)}}{N(S)} = \frac{\frac{9!}{2!3!2!}}{\frac{10!}{3!3!2!}}$ $= \frac{3}{10}$ or 0,3 or 30%	✓ $N(S) = \frac{10!}{3!3!2!}$ ✓ $\mathrm{N(E)} = \frac{9!}{2!3!2!}$ ✓SF ✓answer (4)

10.2 Afrikaans	**Totale moontlike rangskikkings** Lettertellings: • $S = 2$ • $T = 3$ • $I = 2$ • $A = 1$ • $K = 1$ • E $= 1$ Totaal letters $= 10$ $\quad N(S) = \frac{10!}{2!3!2!}$ **Rangskikkings wat op S eindig** Oorblywende letters: • $S = 1$ • $T = 3$ • $I = 2$ • $A = 1$ • $K = 1$ • E $= 1$ Totaal oorblywende letters:$= 9$ $\quad$ N(E) $= \frac{9!}{3!2!}$ $P(E) = \frac{\text{N(E)}}{N(S)} = \frac{\frac{9!}{3!2!}}{\frac{10!}{2!3!2!}}$ $= \frac{1}{5}$ or 0,2 or 20%	✓ $N(S) = \frac{10!}{2!3!2!}$ ✓ N(E) $= \frac{9!}{3!2!}$ ✓SF ✓antwoord (4)
10.3	$\frac{5!}{3!(5-3)!}\left(\frac{7!}{3!(7-3)!}\right) + \frac{5!}{4!(5-4)!}\left(\frac{7!}{2!(7-2)!}\right) + \frac{5!}{5!(5-5)!}\left(\frac{7!}{1!(7-1)!}\right)$ $= (10)(35) + (5)(21) + (1)(7)$ $= 350 + 105 + 7$ $= 462$	✓M ✓answer (2)
		[13]

TOTAL/*TOTAAL*: 150

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education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

NASIONALE SENIOR SERTIFIKAAT

GRAAD 12

WISKUNDE V1

SEPTEMBER 2026

NASIENRIGLYNE

PUNTE: 150

Hierdie nasienriglyne bestaan uit 18 bladsye.

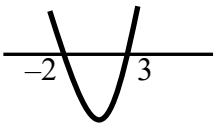
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Blaai om asseblief

LET WEL:

- Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk slegs die EERSTE poging.
- Volgehoue akkuraatheid is DEURGAANS op ALLE aspekte van die nasienriglyne van toepassing.

VRAAG 1

1.1.1	$(3-x)(2x+8)=0$ $x=3 \quad \text{of} \quad 2x=-8$ $x=-4$	✓ $x=3$ ✓ $x=-4$ (2)
1.1.2	$3x^2-7x-2=0$ $x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\dfrac{-(-7)\pm\sqrt{(-7)^2-4(3)(-2)}}{2(3)}$ $=\dfrac{7\pm\sqrt{73}}{6}$ $x=2{,}59 \quad \text{of} \quad x=-0{,}26$	✓ substitusie in die korrekte formule ✓ $x=2{,}59$ ✓ $x=-0{,}26$ (3)
1.1.3	$x^2-x-6\geq 0$ $(x+2)(x-3)\geq 0$ KW : $x=-2$ of $x=3$ $\therefore x\leq -2$ of $x\geq 3$ 	✓ faktore ✓ kritieke waardes ✓✓ antwoord (4)
1.1.4	$12^{2x}=8(36^x)$ $(2^2.3)^{2x}=2^3.(2^2.3^2)^x$ $2^{4x}.3^{2x}=2^3.2^{2x}.3^{2x}$ $\dfrac{2^{4x}}{2^3.2^{2x}}=\dfrac{3^{2x}}{3^{2x}}$ $2^{2x-3}=1$ $2^{2x-3}=2^0$ $2x-3=0$ $2x=3$ $x=\dfrac{3}{2}$ **OR**	✓ priem faktore ✓ eksponent wette ✓ 2 aan een kant, 3 aan ander kant ✓ eksponente gelyk stel ✓ antwoord (5)

	$12^{2x} = 8(36^{x})$ $(2^2.3)^{2x} = 2^3.(2^2.3^2)^x$ $2^{4x}.3^{2x} = 2^3.2^{2x}.3^{2x}$ $2^{4x}.3^{2x} = 2^{3+2x}.3^{2x}$ $2^{4x} = 2^{3+2x}$ or $3^{2x} = 3^{2x}$ $4x = 3 + 2x$ $x \in \mathbb{R}$ $2x = 3$ $x = \frac{3}{2}$	✓ priem faktore ✓ eksponent wette ✓ 2 vergelykings ✓ eksponente gelyk stel ✓ antwoord (5)
1.1.5	$6\sqrt{x-5} + x = 5$ $6\sqrt{x-5} = 5 - x$ $\left(6\sqrt{x-5}\right)^2 = (5-x)^2$ $36(x-5) = 25 - 10x + x^2$ $36x - 180 = 25 - 10x + x^2$ $0 = x^2 - 46x + 205$ $0 = (x-41)(x-5)$ $x = 41$ of $x = 5$ *n.v.t*	✓ isoleer wortel ✓ kwadreer beide kante ✓ standaardvorm ✓ beide antwoorde ✓ seleksie (5)
1.2	$x + y = -2$ $y = -x - 2$ $x^2 - 4x + y^2 + 8y + 2 = 0$ $x^2 - 4x + (-x-2)^2 + 8(-x-2) + 2 = 0$ $x^2 - 4x + x^2 + 4x + 4 - 8x - 16 + 2 = 0$ $2x^2 - 8x - 10 = 0$ $x^2 - 4x - 5 = 0$ $(x+1)(x-5) = 0$ $x = -1$ of $x = 5$ $y = -(-1) - 2$ $y = -(5) - 2$ $= -1$ $= -7$ **OF**	✓ *y* onderwerp ✓substitusie ✓ standaardvorm ✓ beide *x*-waardes ✓ beide *y*-waardes (5)

	$x + y = -2$ $x = -y - 2$ $(-y - 2)^2 - 4(-y - 2) + y^2 + 8y + 2 = 0$ $y^2 + 4y + 4 + 4y + 8 + y^2 + 8y + 2 = 0$ $2y^2 + 16y + 14 = 0$ $y^2 + 8y + 7 = 0$ $(y + 7)(y + 1) = 0$ $y = -7$ of $y = -1$ $x = -(-7) - 2$ $x = -(-1) - 2$ $= 5$ $= -1$	✓ x onderwerp ✓substitusie ✓ standaardvorm ✓ beide y-waardes ✓ beide x-waardes (5)
1.3	$x^2 + k(2x - 4) + 5$ $= x^2 + 2kx - 4k + 5$ $= (x^2 + 2kx + k^2) - k^2 - 4k + 5$ $= (x + k)^2 - k^2 - 4k + 5$ Vir volkome vierkant: $-k^2 - 4k + 5 = 0$ $k^2 + 4k - 5 = 0$ $(k + 5)(k - 1) = 0$ $k = -5$ of $k = 1$ **OF** $x^2 + k(2x - 4) + 5$ $= x^2 + 2kx - 4k + 5$ $\Delta = b^2 - 4ac$ $= (2k)^2 - 4(1)(-4k + 5)$ $= 4k^2 + 16k - 20$ Vir volkome vierkant: $\therefore$ Gelyke wortels $\therefore \Delta = 0$ $4k^2 + 16k - 20 = 0$ $k^2 + 4k - 5 = 0$ $(k + 5)(k - 1) = 0$ $k = -5$ of $k = 1$	✓ vereenvoudig ✓ voltooi vierkant ✓ $-k^2 - 4k + 5 = 0$ ✓ beide antwoorde (4) ✓ vereenvoudig ✓ substitusie ✓ $4k^2 + 16k - 20 = 0$ ✓ beide antwoorde (4)
		[28]

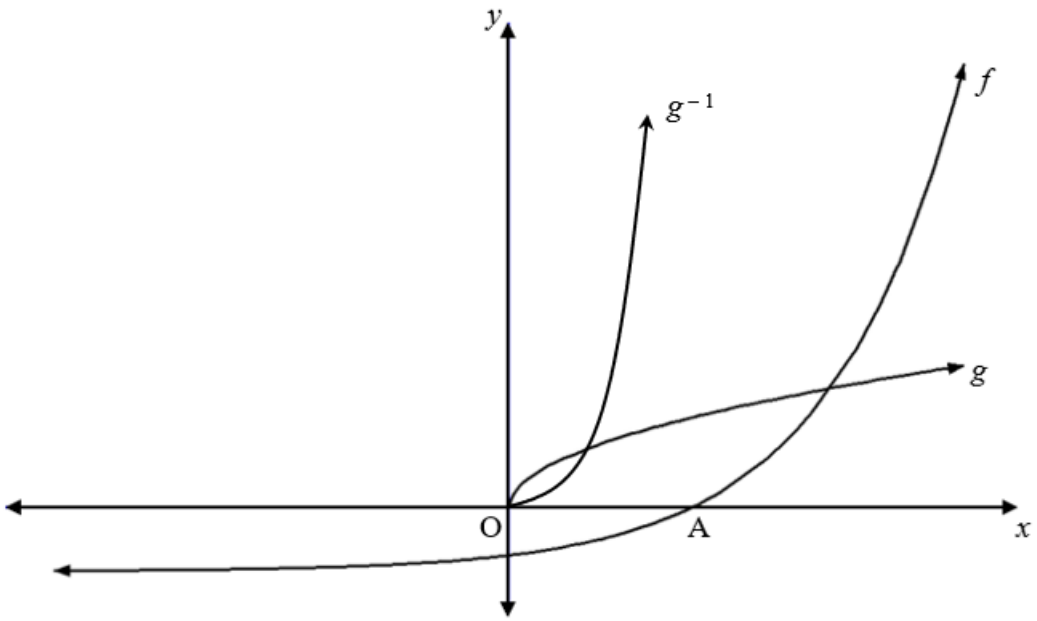
VRAAG 2

2.1.1	$\sum_{k=4}^{p}(2k-5) = 3+5+7+...$	✓ antwoord (1)
2.1.2	$T_n = a+(n-1)d$ $= 3+(n-1)(2)$ $= 2n+1$	✓ substitusie ✓ antwoord (2)
2.1.3	$T_{50} = 2(50)+1$ $= 101$	✓ antwoord (1)
2.1.4	$\sum_{k=4}^{p}(2k-5) < 5\,000$ $3+5+7+...<5\,000$ $S_n = \frac{n}{2}[2a+(n-1)d]$ $\frac{n}{2}[2(3)+(n-1)(2)] < 5\,000$ $6n+2n^2-2n<10\,000$ $2n^2+4n-10\,000<0$ $n^2+2n-5\,000<0$ $-71,71<n<69,72$ maar $n \in N$ $\therefore 0<n\le 69$ of $1\le n\le 69$ $0<p-4+1\le 69$ $1\le p-4+1\le 69$ $\therefore 3<p\le 72$ $4\le p\le 72$	✓ substitusie ✓ standaardvorm ✓ kritieke waardes ✓ antwoord vir n ✓ eindpunte ✓ notasie (6)
2.2.1	$-1+k\ ;\ 2+k\ ;\ 8+k\ ;\ ...$ $\frac{2+k}{-1+k} = \frac{8+k}{2+k}$ $(2+k)^2 = (8+k)(-1+k)$ $4+4k+k^2 = -8+8k-k+k^2$ $12 = 3k$ $k = 4$	✓ verhouding ✓ vereenvoudig ✓ antwoord (3)
2.2.2	$3;\ 6;\ 12$	✓ antwoord (1)
2.2.3	$r=2$ of $r>1$	✓ antwoord (1)
2.2.4	$S_n = \frac{a(r^n-1)}{r-1}$ $S_{15} = \frac{3(2^{15}-1)}{2-1}$ $= 98\,301$	✓ substitusie ✓ antwoord (2)
		[17]

VRAAG 3

	$T_3 = T_7$ simmetrie-as : $n = \frac{3+7}{2} = 5$ kleinste term : $n = \frac{-b}{2a}$ $5 = \frac{-b}{2a}$ $-10a = b$.....(1) $T_2 - T_1 = 3a + b$ .....(2) $-14 = 3a + (-10a)$ $-14 = -7a$ $a = 2$ $(2) : b = -10(2) = -20$ $T_n = 2n^2 - 20n + c$ $10 = 2(5)^2 - 20(5) + c$ $c = 60$ $T_n = 2n^2 - 20n + 60$	✓ $5 = \frac{-b}{2a}$ ✓ $-14 = 3a + (-10a)$ ✓ $a = 2$ ✓ $b = -20$ ✓ substitusie ✓ $c = 60$ (6)
		[6]

VRAAG 4



4.1	$y > -2$	✓ $y > -2$ (1)
4.2	$0 = 2^{x-1} - 2$ $2^1 = 2^{x-1}$ $x - 1 = 1$ $x = 2$ $\therefore$ A(2; 0)	✓ $y = 0$ ✓ $x = 2$ (2)
4.3	$g: y = 2\sqrt{x};\ x \geq 0\ \ y \geq 0$ $g^{-1}: x = 2\sqrt{y};\ y \geq 0\ \ x \geq 0$ $\sqrt{y} = \frac{x}{2}$ $y = \frac{x^2}{4};\ y \geq 0\ \ x \geq 0$	 ✓ ruil x en y om ✓ $y = \frac{x^2}{4}$ (2)

4.4	$D(x) = 2\sqrt{x} - \frac{x^2}{4}$ $= 2x^{\frac{1}{2}} - \frac{x^2}{4}$ $D'(x) = x^{-\frac{1}{2}} - \frac{2x}{4}$ $0 = \frac{1}{\sqrt{x}} - \frac{x}{2}$ $\frac{x}{2} = \frac{1}{\sqrt{x}}$ $\left(\frac{x}{2}\right)^2 = \left(\frac{1}{\sqrt{x}}\right)^2$ $\frac{x^2}{4} = \frac{1}{x}$ $x^3 = 4$ $x = \sqrt[3]{4}$	✓ afstand ✓ $D'(x) = x^{-\frac{1}{2}} - \frac{2x}{4}$ ✓ kwadreer beide kante ✓ antwoord vir x (4)
4.5	$D(x) = 2\left(\sqrt[3]{4}\right)^{\frac{1}{2}} - \frac{\left(\sqrt[3]{4}\right)^2}{4} = 1,89$ $\therefore k > 1,89$	✓ maksimum afstand ✓ antwoord (2)
4.6	$f(x) = 2^{x-1} - 2$ Refleksie om y-as $2^{-x-1} - 2$ $2^{-(x+1)} - 2$ $\left(\frac{1}{2}\right)^{x+1} - 2$ Transleer dan 1 eenheid na regs en transleer 2 eenhede op	✓ refleksie om y-as ✓ 1 eenheid regs ✓ 2 eenhede op (3)
		[14]

VRAAG 5

5.1	$(3\ ;-2)$	✓ $(3\ ;-2)$ (1)
5.2	$0=\frac{1}{2}(x-3)^2-2$ $2=\frac{1}{2}(x-3)^2$ $4=(x-3)^2$ $\pm 2=x-3$ $x=5 \quad \text{of} \quad x=1$ *n.v.t* $\therefore \text{A}(1;0)$ **OF** $0=\frac{1}{2}(x-3)^2-2$ $0=\frac{1}{2}(x^2-6x+9)-2$ $0=\frac{1}{2}x^2-3x+\frac{5}{2}$ $0=x^2-6x+5$ $0=(x-5)(x-1)$ $x=5 \quad \text{of} \quad x=1$ *n.v.t* $\therefore \text{A}(1;0)$	✓ $y=0$ ✓ vereenvoudig ✓ $x=1$ (3) ✓ $y=0$ ✓ vereenvoudig ✓ $x=1$ (3)
5.3	$y\in\mathbb{R};\ y\neq -2$ **OF** $y\in(-\infty;-2)\cup(-2;\infty)$	✓ $y\neq -2$ (1) ✓ $(-\infty;-2)\cup(-2;\infty)$ (1)
5.4	$g(x)=\frac{a}{x+p}+q$ $=\frac{a}{x-1}-2$ $2=\frac{a}{0-1}-2$ $4=-a$ $a=-4$ $g(x)=\frac{-4}{x-1}-2$	✓ substitusie van p en q ✓ substitusie van B(0 ; 2) ✓ antwoord vir a (3)

5.5	$y = -x + c$ $-2 = -(1) + c$ $-1 = c$ $k(x) = -x - 1$ **OF** $y = -(x + p) + q$ $= -(x - 1) - 2$ $= -x + 1 - 2$ $k(x) = -x - 1$	✓ $m = -1$ ✓ substitusie $(1 ; -2)$ ✓ antwoord (3) ✓ $m = -1$ ✓ substitusie $(1 ; -2)$ ✓ antwoord (3)
5.6	$x \in (-\infty ; -1] \cup (1 ; 3]$ **OF** $x \leq -1$ of $1 < x \leq 3$	✓ $(-\infty ; -1]$ ✓✓ $(1 ; 3]$ (3) ✓ $x \leq -1$ ✓✓ $1 < x \leq 3$ (3)
5.7	$f(x) = \frac{1}{2}(x - 3)^2 - 2$ $= \frac{1}{2}(x^2 - 6x + 9) - 2$ $= \frac{1}{2}x^2 - 3x + \frac{5}{2}$ $f'(x) = x - 3$ $-1 = x - 3$ $x = 2$ $f(2) = -1,5$ $k(2) = -(2) - 1$ $= -3$ Vertikale afstand tussen f en k: $f(2) - k(2) = -1,5 - (-3)$ $= 1,5$ $\therefore 1,5 < t < 2$ **OF**	 ✓ vereenvoudig ✓ $f'(x) = -1$ ✓ $x = 2$ ✓ $f(2) = -1,5$ ✓ $k(2) = -3$ ✓ afstand ✓ antwoord (7)

	$f(x)=\frac{1}{2}(x-3)^2-2$ $=\frac{1}{2}(x^2-6x+9)-2$ $=\frac{1}{2}x^2-3x+\frac{5}{2}$	✓ vereenvoudig
	$\frac{1}{2}x^2-3x+\frac{5}{2}=-x-1+t$	✓ gelykstelling
	$\frac{1}{2}x^2-2x+\left(\frac{7}{2}-t\right)=0$	✓ standaard vorm
	$\Delta=b^2-4ac$ $0=(-2)^2-4\left(\frac{1}{2}\right)\left(\frac{7}{2}-t\right)$	✓ $\Delta=0$
	$0=4-7+2t$ $2t=3$ $t=\frac{3}{2}=1,5$	✓ $t=1,5$
	$\therefore 1,5<t<2$	✓ $t<2$ ✓ antwoord (7)
		[21]

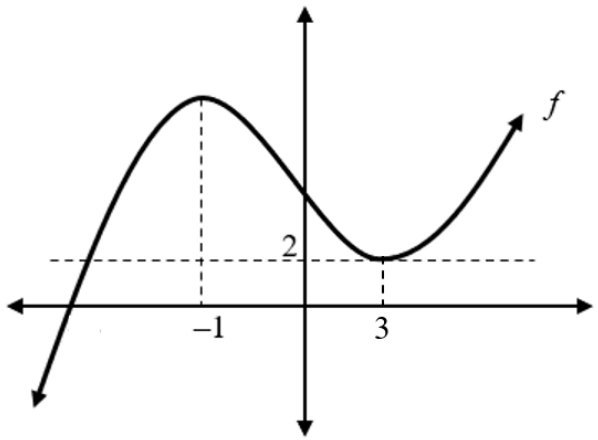
VRAAG 6

6.1	$A = P(1+i)^n$ $= 1\,200\,000\left(1+\frac{0,098}{12}\right)^3$ $= R1\,229\,640,75$	✓ i en n ✓ substitusie ✓ antwoord (3)
6.2	$P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $1\,229\,640,75 = \frac{15\,000\left[1-\left(1+\frac{0,098}{12}\right)^{-n}\right]}{\frac{0,098}{12}}$ $0,6694710772 = 1-\left(1+\frac{0,098}{12}\right)^{-n}$ $\left(1+\frac{0,098}{12}\right)^{-n} = 0,3305289228$ $-n = \log_{\left(1+\frac{0,098}{12}\right)} 0,3305289228$ $-n = -136,1112836$ $\therefore$ 137 maandelikse paaiemente	✓ substitusie ✓ vereenvoudiging ✓ gebruik van logs ✓ antwoord (4)
6.3	$A = P(1+i)^n$ of $A = 1\,229\,640,754\left(1+\frac{0,098}{12}\right)^{77}$ $A = 1\,200\,000\left(1+\frac{0,098}{12}\right)^{80}$ $= R2\,300\,212,589$ $F = \frac{x\left[(1+i)^n-1\right]}{i}$ $= \frac{15\,000\left[\left(1+\frac{0,098}{12}\right)^{77}-1\right]}{\frac{0,098}{12}}$ $= R\,1\,599\,130,824$ Uitstaande balans $= R2\,300\,212,589 - R1\,599\,130,824$ $= R701\,081,76$ Reeds betaal = 77(R15 000) = R1 155 000 Totale koste na 77 maande = R1 155 000 + R701 081,76 = R1 856 081,767 $\therefore$ Wins = $R2\,000\,000$ − R1 856 081,767 $= R143\,918,24$ **OF**	✓ substitusie in A formule ✓ substitusie in F formule ✓ uitstaande balans ✓ paaiemente betaal ✓ totale koste ✓ wins (6)

	Uitstaande tydperk $= 136{,}1112836 - 77$ $= 59{,}1112836$	✓ n
	$P = \dfrac{x\left[1-(1+i)^{-n}\right]}{i}$ $= \dfrac{15\,000\left[1-\left(1+\dfrac{0{,}098}{12}\right)^{-59{,}1112836}\right]}{\dfrac{0{,}098}{12}}$	✓ substitusie in P formule
	$= R701\,081{,}76$	✓ uitstaande balans
	Reeds betaal $= 77(\text{R}15\,000)$ $= \text{R}1\,155\,000$	✓ paaiemente betaal
	Totale koste na 77 maande $= \text{R}1\,155\,000 + \text{R}701\,081{,}76$ $= \text{R}1\,856\,081{,}767$	✓ totale koste
	$\therefore$ Wins $= R2\,000\,000 - \text{R}1\,856\,081{,}767$ $= R143\,918{,}24$	✓ wins (6)
		[13]

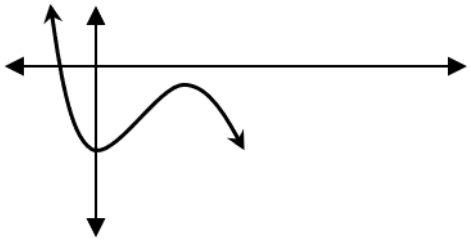
VRAAG 7

7.1	$f(x) = 3x^2 - x$ $f(x+h) = 3(x+h)^2 - (x+h)$ $= 3(x^2 + 2xh + h^2) - x - h$ $= 3x^2 + 6xh + 3h^2 - x - h$	✓ vereenvoudig $f(x+h)$
	$f(x+h) - f(x)$ $= 3x^2 + 6xh + 3h^2 - x - h - (3x^2 - x)$ $= 6xh + 3h^2 - h$	✓ $6xh + 3h^2 - h$
	$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \to 0} \frac{6xh + 3h^2 - h}{h}$ $= \lim_{h \to 0} \frac{h(6x + 3h - 1)}{h}$ $= \lim_{h \to 0} (6x + 3h - 1)$ $= 6x - 1$	✓ substitusie ✓ gemeenskaplike faktor ✓ antwoord (5)
	OF	
	$f(x) = 3x^2 - x$ $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \to 0} \frac{[3(x+h)^2 - (x+h)] - (3x^2 - x)}{h}$ $= \lim_{h \to 0} \frac{3(x^2 + 2xh + h^2) - x - h - 3x^2 + x}{h}$ $= \lim_{h \to 0} \frac{3x^2 + 6xh + 3h^2 - x - h - 3x^2 + x}{h}$ $f'(x) = \lim_{h \to 0} \frac{6xh + 3h^2 - h}{h}$ $= \lim_{h \to 0} \frac{h(6x + 3h - 1)}{h}$ $= \lim_{h \to 0} (6x + 3h - 1)$ $= 6x - 1$	✓ substitusie ✓ vereenvoudig $f(x+h)$ ✓ $6xh + 3h^2 - h$ ✓ gemeenskaplike faktor ✓ antwoord (5)
7.2.1	$D_x[(x-3)(x-1)]$ $= D_x[x^2 - 4x + 3]$ $= 2x - 4$	✓ vereenvoudig ✓ $2x$ ✓ -4 (3)

7.2.2	$f(x) = 2\sqrt[3]{x^4} + \frac{3}{x^5}$ $= 2x^{\frac{4}{3}} + 3x^{-5}$ $f'(x) = \frac{8}{3}x^{\frac{1}{3}} - 15x^{-6}$	✓ $2x^{\frac{4}{3}}$ ✓ $3x^{-5}$ ✓ $\frac{8}{3}x^{\frac{1}{3}}$ ✓ $-15x^{-6}$ (4)
7.3		✓ slegs een x-afsnit by $x < -1$ ✓ maksimum draaipunt by $x = -1$ ✓ minimum draaipunt by (3 ; 2) ✓ vorm (4)
		[16]

VRAAG 8

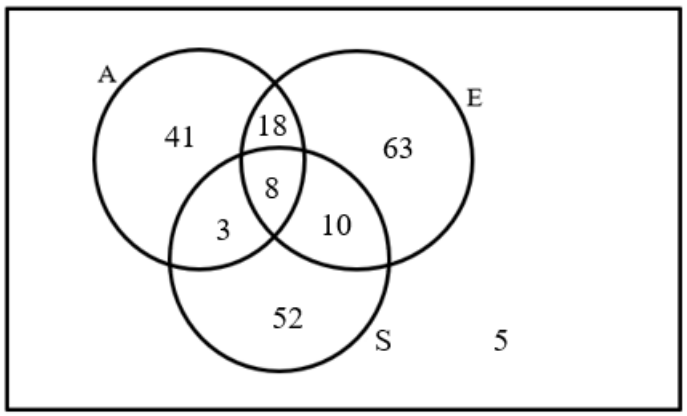
8.1	$f(x) = -2x^3 + 21x^2 - 60x + 43$ $f'(x) = -6x^2 + 42x - 60$ $0 = -6x^2 + 42x - 60$ $0 = x^2 - 7x + 10$ $0 = (x-2)(x-5)$ $x_A = 2$ of $x_B = 5$	✓ $0 = -6x^2 + 42x - 60$ ✓ faktore ✓ beide antwoorde (3)
8.2	$f''(x) = -12x + 42$ **OF** $x = \frac{5+2}{2}$ $0 = -12x + 42$ $12x = 42$ $x = \frac{7}{2} = 3,5$ $f(3,5) = -2(3,5)^3 + 21(3,5)^2 - 60(3,5) + 43$ $= 4,5$ $f'(3,5) = -6(3,5)^2 + 42(3,5) - 60$ $= 13,5$ $y - y_1 = m(x - x_1)$ $y - 4,5 = 13,5(x - 3,5)$ $y = 13,5x - 42,75$	✓ metode ✓ x-waarde ✓ y-waarde ✓ $f'(3,5) = 13,5$ ✓ antwoord (5)

8.3	$f(5) = -2(5)^3 + 21(5)^2 - 60(5) + 43$ $= 18$  $\therefore$ Geen positiewe wortels	✓ $f(5) = 18$ ✓ metode ✓ antwoord (3)
		[11]

VRAAG 9

9.1	$A = l^2 + 2\pi rh$ $= (2x)^2 + 2\pi xh$ $= 4x^2 + 2\pi xh$	✓ $(2x)^2 + 2\pi xh$ (1)
9.2	$20 = 4x^2 + 2\pi xh$ $20 - 4x^2 = 2\pi xh$ $h = \frac{20 - 4x^2}{2\pi x}$ $h(x) = \frac{20}{2\pi x} - \frac{4x^2}{2\pi x}$ $h(x) = \frac{10}{\pi x} - \frac{2x}{\pi}$	✓ A = 20 ✓ h die onderwerp ✓ antwoord (3)
9.3	$V(x) = \pi r^2 h$ $= \pi x^2\left(\frac{10}{\pi x} - \frac{2x}{\pi}\right)$ $= 10x - 2x^3$	✓ substitusie (1)
9.4	$V'(x) = 10 - 6x^2$ $0 = 10 - 6x^2$ $6x^2 = 10$ $x^2 = \frac{10}{6}$ $x = 1,29$ $V(1,29) = 10(1,29) - 2(1,29)^3$ $= 8,61\text{m}^3$	✓ $V'(x)$ ✓ $V'(x) = 0$ ✓ antwoord vir x ✓ antwoord (4)
		[9]

VRAAG 10

10.1		✓ 8; 5 ✓ 3; 18; 10 ✓ 41; 52; 63 (3)
10.2	$\text{P(slegs EEN taal)} = \frac{41 + 63 + 52}{200}$ $= \frac{156}{200} = 0,78 = 78\%$	✓ substitusie ✓ antwoord (2)
10.3	$\text{P(A)} \times P(\text{S}) = \frac{70}{200} \times \frac{73}{200}$ $= \frac{511}{4\ 000} \approx 0,13$ $\text{P(A en S)} = \frac{11}{200} = 0,06$ $\therefore$ P(A) × P(S) ≠ P(A en S) $\therefore$ Nie onafhanklik nie	✓ P(A) × P(S) ✓ P(A en S) ✓ P(A)×P(S) ≠ P(A en S) ✓ gevolgtrekking (4)
		[9]

VRAAG 11

11.1	$8! = 40\,320$	✓ antwoord (1)
11.2	$\frac{(5!)(4!)}{8!}$ $= \frac{1}{14} = 0,07$	✓ $(5!)(4!)$ ✓ antwoord (A) (2)
11.3	Wiskunde en Fisiese Wetenskappe langs mekaar $= 3 \times 5! \times 2! \times 2 = 1\,440$ Totaal $= 3 \times 6! \times 2 = 4\,320$ Wiskunde en Fisiese Wetenskappe nie langs mekaar $= 4\,320 - 1\,440$ $= 2\,880$	✓ $3 \times 5! \times 2! \times 2$ ✓ $3 \times 6! \times 2$ ✓ antwoord (3)
		[6]
		TOTAAL: 150

Kopiereg voorbehou

KOGNITIEWE VLAKKE **WISKUNDE V1**

	KOGNITIEWE VLAKKE				ONDERWERPE						
	VLAK 1 (20%)	VLAK 2 (35%)	VLAK 3 (30%)	VLAK 4 (15%)							
VRAAG	KENNIS	ROETINE PROSEDURES	KOMPLEKSE PROSEDURES	PROBLEEM OPLOSSING	ALGEBRA	PATRONE	FUNKSIES	FINANSIES	DIFFERENSIASIE	WAARSKYNLIK-HEID	TOTALE PUNT
1.1.1	2				2						
1.1.2	3				3						
1.1.3		4			4						
1.1.4			5		5						
1.1.5		5			5						
1.2		5			5						
1.3				4	4						**28**
2.1.1	1					1					
2.1.2	2					2					
2.1.3	1					1					
2.1.4			6			6					
2.2.1		3				3					
2.2.2	1					1					
2.2.3	1					1					
2.2.4	2					2					**17**
3				6		6					**6**
4.1	1						1				
4.2		2					2				
4.3		2					2				
4.4				4			4				
4.5				2			2				
4.6			3				3				**14**
5.1	1						1				
5.2		3					3				
5.3	1						1				
5.4		3					3				
5.5	3						3				
5.6	3						3				
5.7			7				7				**21**
6.1	3							3			
6.2			4					4			
6.3				6				6			**13**

Kopiereg voorbehou

	KOGNITIEWE VLAKKE				ONDERWERPE						
	VLAK 1 (20%)	VLAK 2 (35%)	VLAK 3 (30%)	VLAK 4 (15%)							
QUESTION	KENNIS	ROETINE PROSEDURES	KOMPLEKSE PROSEDURES	PROBLEEM OPLOSSING	ALGEBRA	PATRONE	FUNKSIES	FINANSIES	DIFFERENSIASIE	WAARSKYNLIK-HEID	TOTALE PUNT
7.1	5								5		
7.2.1		3							3		
7.2.2		4							4		
7.3			4						4		**16**
8.1		3							3		
8.2			5						5		
8.3			3						3		**11**
9.1		1							1		
9.2		3							3		
9.3			5						5		**9**
10.1		3								3	
10.2		2								2	
10.3		4								4	9
11.1	1										
11.2		2									
11.3			3								**6**
TOT	**31**	**52**	**45**	**22**	**28**	**23**	**35**	**13**	**36**	**15**	**150**
%	**20%**	**35%**	**30%**	**15%**							
Pol	**20%**	**35%**	**30%**	**15%**	**25**	**25**	**35**	**15**	**35**	**15**	**150**

Kopiereg voorbehou

MARKING GUIDELINES / *NASIENRIGLYNE*

EXAMINATION *EKSAMEN*	**NATIONAL SENIOR CERTIFICATE** *NASIONALE SENIOR SERTIFIKAAT*
GRADE / *GRAAD*	12
DATE / *DATUM*	SEPTEMBER 2026
SUBJECT / *VAK*	MATHEMATICS / *WISKUNDE*
PAPER / *VRAESTEL*	1
MARK TOTAL / *PUNTETOTAAL*	150
DURATION (HOURS) / *TYDSDUUR (UUR)*	3
NUMBER OF PAGES / *AANTAL BLADSYE*	14

FINAL

SACAI

SOUTH AFRICAN COMPREHENSIVE ASSESSMENT INSTITUTE

SUID-AFRIKAANSE KOMPREHENSIEWE ASSESSERINGSINSTITUUT

NOTE:

- If a candidate answered a question TWICE, only mark the first attempt.
- If a candidate cancelled the first attempt and did not answer the question again, mark the cancelled attempt.
- The principle of consistent accuracy (CA) will be applied throughout the memorandum.
- If a candidate has given the answer only, without showing any necessary working out, only ONE mark will be given.

NOTA:

- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord het, merk slegs die eerste poging.*
- *Indien 'n kandidaat die eerste poging uitgekanselleer het en nie die vraag weer probeer het nie, merk die uitgekanselleerde poging.*
- *Die beginsel van konsekwente akkuraatheid (CA) sal reg deur die memorandum toegepas word.*
- *As die kandidaat slegs die antwoord gee, sonder om enige nodige berekeninge te toon, gee slegs EEN punt.*

FINAL

QUESTION / *VRAAG* 1

1.1	$x^2 - 1 = 7x$ $x^2 - 7x - 1 = 0$ $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ $x = \frac{-(-7) \pm \sqrt{(-7)^2-4(1)(-1)}}{2(1)}$ $x = 7{,}14 \quad or \quad x = -0{,}14$	✓ Standard form/*Standaard vorm* ✓ Substitution/*Vervanging* ✓ Answer/*Antwoord* Penalise Rounding/*Penaliseer afronding*	(3)
1.2	$(x+1)^2 \geq 0$ $x \in \mathbb{R}$ OR / *OF* $x \in (-\infty; \infty)$	✓✓ $x \in \mathbb{R}$ **OR/*OF*** ✓ Notation/*Notasie* ✓ Critical Values/*Kritieke waardes*	(2)
1.3	$\sqrt{x+3} - 2x = 0$ $\sqrt{x+3} = 2x$ $x + 3 = 4x^2$ $4x^2 - x - 3 = 0$ $(x-1)(4x+3) = 0$ $x = 1 \ or \ x \neq -\frac{3}{4}$	✓ Isolate root/*Isoleer wortel* ✓ Square both sides/*Kwadreer beide kante* ✓ Standard form/*Standaard vorm* ✓ Factors/*Faktore* ✓ Answer/*Antwoord* Penalise if $x = -\frac{3}{4}$ not eliminated *Penaliseer as* $x = -\frac{3}{4}$ *nie geëlimineer is nie*	(5)
1.4	$5 \cdot 3^{1-x} = 135$ $3^{1-x} = 27$ $3^{1-x} = 3^3$ $1 - x = 3$ $x = -2$	✓ Divide with 5/*deel met 5* ✓ Prime bases/*priemgetal basis* ✓ Answer/*Antwoord*	(3)
			[13]

FINAL

QUESTION / *VRAAG* 2

2.1	$x^2 - 2kx + k^2 - 3 = 0$ $\Delta = (-2k)^2 - 4(1)(k^2 - 3)$ $\Delta = 4k^2 - 4k^2 + 12$ $\Delta = 12$ ∴ Roots are Irrational and unequal / *Wortels is irrasioneel en ongelyk*	✓ Substitution / *Vervanging* ✓ Answer / *Antwoord* ✓ Conclusion / *Gevolgtrekking*	(3)
2.2	$16^{p^2} = \frac{2^{x^2}}{16^{x-1}}$ $2^{4p^2} = \frac{2^{x^2}}{2^{4(x-1)}}$ $2^{4p^2} = 2^{x^2-4x+4}$ $4p^2 = x^2 - 4x + 4$ $4p^2 = (x-2)^2$ $x - 2 = \pm\sqrt{4p^2}$ $x = 2 \pm 2p$	✓ Prime bases / *Priem basis* ✓ Exponential laws / *Eksponent wet* ✓ Equate exponents / *Stel eksponente gelyk* ✓ Square root / *Vierkantswortel* ✓ Answer / *Antwoord*	(5)
2.3	$y = -\frac{1}{2}x + 3$ $-\frac{1}{2}x + 3 = x^2 - 6x$ $-x + 6 = 2x^2 - 12x$ $2x^2 - 11x - 6 = 0$ $(x-6)(2x+1) = 0$ $x = 6 \quad or \quad -\frac{1}{2}$ $y = 0 \quad or \quad y = \frac{13}{4}$ OR/*OF* $x = -2y + 6$ $y = (-2y+6)^2 - 6(-2y+6)$ $y = 4y^2 - 24y + 36 + 12y - 36$ $0 = 4y^2 - 13y$ $0 = y(4y - 13)$ $y = 0 \quad or \quad y = \frac{13}{4}$ $x = 6 \quad or \quad x = -\frac{1}{2}$	✓ Making y the subject ✓ Substitution / *vervanging* ✓ Standard form / *standaard vorm* ✓ Both x values / *Beide x waardes* ✓ Both y values / *beide y waardes* ✓ Making x the subject ✓ Substitution / *vervanging* ✓ standard form / *standaard vorm* ✓ Both y values / *Beide y waardes* ✓ Both x values / *beide x waardes*	(5)
			[13]

FINAL

QUESTION / *VRAAG* 3

3.1	$\frac{2^{0-1}}{0+1}+\frac{2^{1-1}}{1+1}+\frac{2^{2-1}}{2+1}+\frac{2^{3-1}}{3+1}$ $=\frac{1}{2}+\frac{1}{2}+\frac{2}{3}+1$ $=2\frac{2}{3}\ or\ \frac{8}{3}$	✓ Expanding / *Uitbreiding* ✓ Answer / *Antwoord*	(2)
3.2.1	$\frac{x}{-2}=-\frac{32}{x}$ $x^2=64$ $x=\pm 8$	✓ Equating ratio / *Stel verhoudings =* ✓ Both answer / *Beide antwoorde*	(2)
3.2.2	$r=\frac{8}{-2}=-4$ $S_{11}=-\frac{2\left((-4)^{11}-1\right)}{-4-1}$ $=-1677722$	✓ $r=-4$ ✓ Substitution / *Vervanging* ✓ Answer / *Antwoord*	(3)
3.2.3	-2 -17 -32 -15 -15 $d=-15$ $T_{100}=-2+(100-1)(-15)$ $=-1487$	✓ $d=-15$ ✓ Substitution / *vervanging* ✓ Answer / *Antwoord*	(3)
3.3	2 16 30 14 14 $2a=14$ $a=7$ $3(7)+b=2$ $b=-19$ $T_n=7n^2-19n+16$ $T_1=7(1)^2-19(1)+16$ $=4$ OR $T_0=16$ $T_1-T_0=-12$ $T_1=-12+16$ $=4$	✓ $d=14$ ✓ $a=7$ ✓ $b=-19$ ✓ Substitution ✓ $T_1=4$	(5)

FINAL

OR

$T_1 = a + b + 16$

$T_2 = 4a + 2b + 16$

$T_3 = 9a + 3b + 16$

$T_2 - T_1 = 2$

$4a + 2b + 16 - (a + b + 16) = 2$

$3a + b = 2$

$T_3 - T_2 = 16$

$9a + 3b + 16 - (4a + 2b + 16) = 16$

$5a + b = 16$

$2a = 14$

$a = 7$

$3(7) + b = 2$

$b = -19$

[15]

FINAL

QUESTION / *VRAAG* 4			
4.1	$d^2 = \left(4\sqrt{2}\right)^2 + \left(4\sqrt{2}\right)^2$ $d^2 = 64$ $d = 8$ $r = 4$ Area = $\pi(4)^2$ $= 16\pi$	✓ Substitution / *Vervanging* ✓ $d = 8$ ✓ Radius = 4 ✓ Substitution / *Vervanging*	(4)
4.2	Radius $\frac{1}{2}(4) = 2$ Area = $\pi(2)^2$ $= 4\pi$ OR Radius = $\frac{1}{2}\left(4\sqrt{2}\right) = 2\sqrt{2}$ Area = $\pi\left(2\sqrt{2}\right)^2$ $= 8\pi$	✓ Radius $= 2$ ✓ Substitution ✓ Answer / *Antwoord* ✓ Radius $2\sqrt{2}$ ✓ Substitution ✓ Answer	(3)
4.3	$KJ = 4 - 2$ $= 2$ Area = $\pi(1)^2$ $= \pi$ OR KJ = $4\sqrt{2} - 2$ Area = $\pi\left(2\sqrt{2} - 1\right)^2$ $= \left(9 - 4\sqrt{2}\right)\pi$	✓ FH – 2 units ✓ KJ ✓ Answer / *Antwoord*	(3)
4.4	DO not mark this question.		(0)
			[10]

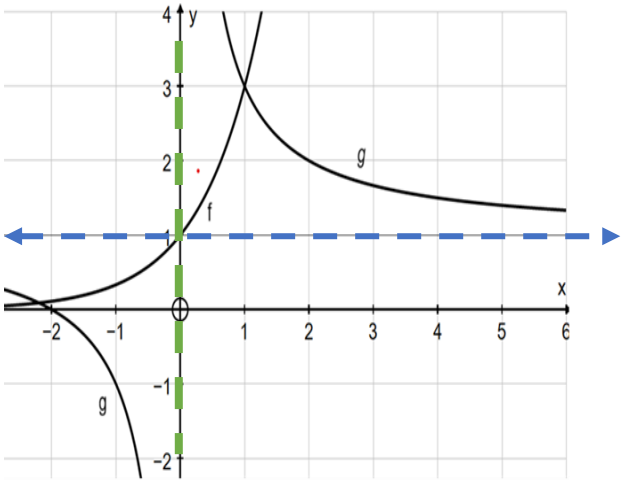
FINAL

QUESTION / *VRAAG* 5

5.1.1	$A = P(1+i)^n$ $4277{,}28 = 3000\left(1+\frac{0{,}12}{4}\right)^{4n}$ $1{,}42576 = \left(1+\frac{0{,}12}{4}\right)^{4n}$ $4n = \log_{\left(1+\frac{0{,}12}{4}\right)}(1{,}42576)$ $4n = 11{,}99997896$ $n = 2{,}999994739$ $\therefore 3\ years/jaar$	✓ Correct Substitution / *Korrekte vervanging* ✓ Correct use of log / *korrekte gebruik van log* ✓ Answer / *Antwoord*	(3)
5.1.2	$A = 4277{,}28\left(1+\frac{0{,}13}{4}\right)^8 + \frac{1000\left[\left(1+\frac{0{,}13}{4}\right)^8-1\right]}{\frac{0{,}13}{4}}$ $A = 5524{,}43876 + 8971{,}616471$ $A = R14\ 496{,}06$	✓ $4277{,}28\left(1+\frac{0{,}13}{4}\right)^8$ ✓ $\frac{1000\left[\left(1+\frac{0{,}13}{4}\right)^8-1\right]}{\frac{0{,}13}{4}}$ ✓ $i = \frac{0{,}13}{4}$ ✓ $n = 8$ ✓ Answer / *Antwoord*	(5)
5.2.1	$\frac{200000}{16} \times 100$ $= R1\ 250\ 000$	✓ $\frac{200000}{16} \times 100$ ✓ Answer / *Antwoord*	(2)
5.2.2	$1050000\left(1+\frac{0{,}11}{12}\right)^2 = \frac{x\left(1-\left(1+\frac{0{,}11}{12}\right)^{-238}\right)}{\frac{0{,}11}{12}}$ $x = R11\ 063{,}26$	✓ $1050000\left(1+\frac{0.11}{12}\right)^2$ ✓ $i = \frac{0{,}11}{12}$ ✓ $n = 238$ ✓ Substitution / *vervanging* ✓ Answer / *Antwoord*	(5)
			[15]

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QUESTION / *VRAAG* 6

6.1		✓ Horizontal asymptote / *horisontale asimptoot* ✓ Vertical asymptote ✓ Shape of f ✓ Shape of g ✓ y –intercept of f / y –afsnit van f ✓ x –intercept of g / x –afsnit van g	(6)
6.2	$y \in \mathbb{R}; y \neq 1$	✓ Answer / *Antwoord*	(1)
6.3.1	$x \in \mathbb{R}; x > 0$	✓ Answer / *Antwoord*	(1)
6.3.2	$x \in \mathbb{R}; x \neq 2$ OR / *OF* $x \in (-\infty; 2) \cup (2; \infty)$	✓ Answer / *Antwoord*	(1)
6.4	$x \in (0; 1]$ OR / *OF* $0 < x \leq 1$	✓ Critical values / *kritieke waardes* ✓ Notation / *notasie*	(2)
6.5	$m = -1$ $y = -x + c$ $0 = -1 + c$ $c = 1$ $y = -x + 1$	✓ $m = -1$ ✓ Substitution / *vervanging* ✓ Answer / *Antwoord*	(3)
			[14]

FINAL

QUESTION / *VRAAG 7*			
7.1.1	$3 = \log_4 k$ $4^3 = k$ $k = 64$	✓ Substitution / *vervanging* ✓ Answer / *antwoord*	(2)
7.1.2	$y = \log_4 x$ $x = \log_4 y$ $g^{-1}(x) = 4^x$	 ✓ Swop x and y / *ruil x en* ✓ Answer / *Antwoord* ✓✓Answer only / *Slegs antwoord*	(2)
7.2	ii	✓ Answer / *antwoord*	(1)
7.3.1	$y = a(x - x_1)(x - x_2)$ $y = a(x + 3)(x - 2)$ $8 = a(1 + 3)(1 - 2)$ $8 = a(4)(-1)$ $8 = -4a$ $a = -2$ $y = -2(x + 3)(x - 2)$ $y = -2(x^2 + x - 6)$ $y = -2x^2 - 2x + 12$ $\therefore b = -2$ and $c = 12$	 ✓ Substitution / *vervanging* ✓ Substitute $(1; 8)$ / *vervang* ✓ Substitution / *vervanging* ✓ Simplification / *vereenvoudiging*	(4)
7.3.2	$f(x) = -2x^2 - 2x + 12$ $f'(x) = -4x - 2 < 0$ $x > -\frac{1}{2}$ OR / *OF* $x = \frac{-3+2}{2}$ or $x = \frac{-(-2)}{2(-2)}$ $x = -\frac{1}{2}$ $x > -\frac{1}{2}$	 ✓ $f'(x)$ ✓ $f'(x) < 0$ ✓ Answer / *antwoord* ✓ Substitution / *vervanging* ✓ $x = -\frac{1}{2}$ ✓Answer / *Antwoord* *ANSWER ONLY 2/3*	(3)
7.3.3	$f'(1) = -4(1) - 2$ $= -6$ $y - 8 = -6(x - 1)$ $y = -6x + 14$ OR / *OF* $8 = -6(1) + c$ $c = 14$	✓ Substitution / *Vervanging* ✓ -6 ✓ Substitution / *vervanging* ✓ Answer / *Antwoord* ✓ Substitution / *vervanging* ✓ Answer / *Antwoord*	(4)

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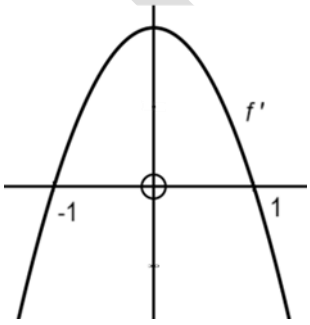
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7.3.4	$p < -2$	✓ Critical Value / *kritieke waarde* ✓ notation / *notasie*	(2)
			[18]
QUESTION / *VRAAG* 8			
8.1	$f(x) = -2x^2$ $f(x+h) = -2(x+h)^2$ $= -2(x^2 + 2xh + h^2)$ $= -2x^2 - 4xh - 2h^2$ $f'(x) = \lim_{h\to 0} \frac{-2x^2-4xh-2h^2+2x^2}{h}$ $= \lim_{h\to 0} \frac{-4xh-2h^2}{h}$ $= \lim_{h\to 0} \frac{h(-4x-2h)}{h}$ $= \lim_{h\to 0}(-4x-2h)$ $= -4x - 2(0)$ $= -4x$	✓ $f(x+h)$ ✓ Substitution / *vervanging* ✓ Simplification / *vereenvoudiging* ✓ Factor / *faktor* ✓ Answer / *antwoord* *Penalise notation*	(5)
8.2.1	$f(x) = \frac{3x^4}{3x^2} - \frac{2x}{3x^2} + \frac{6x^2}{3x^2}$ $= x^2 - \frac{2}{3x} + 2$ $= x^2 - \frac{2}{3}x^{-1} + 2$ $\therefore f'(x) = 2x + \frac{2}{3}x^{-2}$	✓ Simplification / *vereenvoudiging* ✓ x^{-1} ✓ $2x$ ✓ $\frac{2}{3}x^{-2}$	(4)
8.2.2	$f'(1) = 2(1) + \frac{2}{3}(1)^{-2}$ $= \frac{8}{3}$ or/of $2\frac{2}{3}$	✓ Substitution / *Vervanging* ✓ Answer / *Antwoord*	(2)
8.3.1	$y = 5 + \sqrt[3]{t^6}$ $y = 5 + t^{\frac{6}{3}}$ $y = 5 + t^2$ $\frac{dy}{dt} = 2t$	✓ $y = 5 + t^2$ ✓ Answer / *antwoord*	(2)
8.3.2	$y = 5 + \left(\frac{1}{x}\right)^2$ $y = 5 + x^{-2}$ $\frac{dy}{dx} = -2x^{-3}$	✓ Substitution / *vervanging* ✓ $y = 5 + x^{-2}$ ✓ answer / *antwoord*	(3)

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QUESTION / *VRAAG* 9

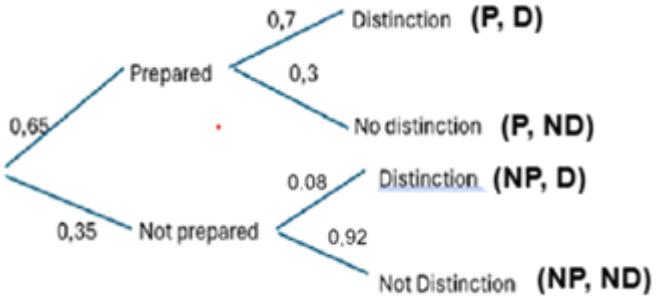
9.1.1	$B(0;4)$	✓ Answer / *Antwoord*	(1)
9.1.2	$y = -(x+k)(x+2)^2$ $4 = -(0+k)(0+2)^2$ $4 = -4k$ $k = -1$	✓ Substitution / vervanging ✓ Simplification / vervanging	(2)
9.1.3	$A(-2;0)$ $m = \frac{4-0}{0+2}$ $= 2$	✓ $A(-2;0)$ ✓ Substitution / *vervanging* ✓ Answer / *antwoord*	(3)
9.1.4	$f(x) = -(x-1)(x+2)^2$ $f(x) = -(x-1)(x^2+4x+4)$ $f(x) = -(x^3+4x^2+4x-x^2-4x-4)$ $f(x) = -(x^3+3x^2-4)$ $f(x) = -x^3-3x^2+4$ $f'(x) = -3x^2-6x$ $f''(x) = -6x-6$ $-6x-6>0$ $x<-1$	✓ $f(x) = -x^3-3x^2+4$ ✓ $f'(x) = -3x^2-6x$ ✓ $f''(x) = -6x-6>0$ ✓ Answer / *antwoord* *Answer only Full marks:* *2 marks for* $x=-1$ *2 marks for Notation*	(4)
9.2		✓✓ x –intercepts/*afsnitte* ✓ Shape / *vorm* ✓ Turning point / *draaipunt*	(4)

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QUESTION / *VRAAG* 10			
10.1	$s = \frac{d}{t}$ $6 = \frac{d}{t}$ $d = 6t$	✓ Answer / *antwoord*	(1)
10.2	B: $20 - 9t$ $AB^2 = (6t)^2 + (20 - 9t)^2$ $AB^2 = 36t^2 + 400 - 360t + 81t^2$ $AB^2 = 117t^2 - 360t + 400$	✓ $20 - 9t$ ✓ Substitution / vervanging	(2)
10.3	Min AB: $AB^{2\,'}(t) = 234t - 360 = 0$ $t = \frac{20}{13} = 1{,}538\ s$	✓ $234t - 360$ ✓ $= 0$ ✓ Answer / *antwoord*	(3)
10.4	Min AB: $= \sqrt{117\left(\frac{20}{13}\right)^2 - 360\left(\frac{20}{13}\right) + 400}$ $= 11\ m$	✓ Answer / *antwoord*	(1)
			[7]

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QUESTION / *VRAAG* 11			
11.1.1		✓ Branch 1 / *tak 1* ✓ Branch 2 / *tak 2* ✓ Branch 3 / *tak 3* *Penalise once if outcomes are not shown*	(3)
11.1.2	$0{,}92$	✓ answer / *antwoord*	(1)
11.1.3	$(0{,}65 \times 0{,}7) + (0{,}35 \times 0{,}08)$ $= 0{,}483$ $0{,}483 \times 120$ $\approx 58\ students\ /\ studente$	✓ $(0{,}65 \times 0{,}7)$ ✓ $(0{,}35 \times 0{,}08)$ ✓ $\times 120$ ✓ 58	(4)
11.2	$\frac{15}{30} \times \frac{14}{29}$ $= \frac{7}{29}$ OR / *OF* $0{,}24$	✓ $\frac{15}{30}$ ✓ $\frac{14}{29}$ ✓ Answer / *antwoord*	(3)
11.3.1	$6! = 720$	✓ Answer / *antwoord*	(1)
11.3.2	Top: 1 Middel: 2! Bottom: 2! $\therefore 1 \times 2! \times 2! = 4$	✓ 2! ✓ 2! ✓ Answer / *antwoord*	(3)
			[15]
			GRAND TOTAL / *GROOTTOTAAL*: [150]

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Western Cape Government
Education
FOR YOU

NATIONAL SENIOR CERTIFICATE/
NASIONALE SENIOR SERTIFIKAAT

GRADE 12 / GRAAD 12

MATHEMATICS P1/ WISKUNDE V1
SEPTEMBER 2026
MARKING GUIDELINES / NASIENRIGLYNE

MARKS / PUNTE: 150

These marking guidelines consist of 18 pages.
Hierdie nasienriglyne bestaan uit 18 bladsye.

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NOTE:

- **If a candidate answers a question TWICE, only mark the FIRST attempt.**
- **Consistent Accuracy applies in all aspects of the marking guidelines.**

LET WEL:

- ***Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.***
- ***Volgehoue akkuraatheid is DEURGAANS op ALLE aspekte van die nasienriglyne van toepassing.***

QUESTION 1/*VRAAG* 1

1.1.1	$x^2+3x-10=0$ $(x+5)(x-2)=0$ $x=-5 \ \ or \ x=2$	✓ factorise ✓✓ answers (3)
1.1.2	$2x^2-7x-3=0$ $x=\frac{-(-7)\pm\sqrt{(-7)^2-4(2)(-3)}}{2(2)}$ $x=3{,}89 \quad$ or $\quad x=-0{,}39$	✓ std form ✓ sub ✓✓ answers (4)
1.1.3	$3x^2+13x+10\geq 0$ $(3x+10)(x+1)\geq 0$ $cv: x=-\frac{10}{3} \ or \ x=-1$ $x\leq -\frac{10}{3} \ or \ x\geq -1$	✓ cv / factors ✓✓ answers (3)
1.1.4	$2\sqrt{x+9}=x-6$ $\left(2\sqrt{x+9}\right)^2=(x-6)^2$ $4x+36=x^2-12x+36$ $x^2-16x=0$ $x(x-16)=0$ $x\neq 0 \ \ or \ x=16$	✓ isolate surd ✓ square both sides ✓ std form ✓ answer with selection (4)

1.2	$x+y=8$	✓ equation
	$x=8-y$	✓ x subject
	$(8-y)^2+5(8-y)y+6y^2=0$	✓ substitute
	$64-16y+y^2+40y-5y^2+6y^2=0$	
	$2y^2+24y+64=0$	✓ standard form
	$y^2+12y+32=0$	
	$(y+8)(y+4)=0$	✓ both y values
	$y=-8$ *or* $y=-4$	✓ both x values
	$x=16$ *or* $x=12$	
	OR	
	$x+y=8$	✓ equation
	$y=8-x$	✓ y subject
	$x^2+5x(8-x)+6(8-x)^2=0$	✓ substitute
	$x^2+40x-5x^2+384-96x+6x^2=0$	
	$2x^2-56x+384=0$	
	$x^2-28x+192=0$	✓ standard form
	$(x-16)(x-12)=0$	
	$x=16$ *or* $x=12$	✓ both x values
	$y=-8$ *or* $y=-4$	✓ both y values
	OR	
	$x+y=8$	
	$x=8-y$	✓ equation
	$x^2+5xy+6y^2=0$	✓ x subject of formula
	$(x+3y)(x+2y)=0$	
	$x=-3y$ *or* $x=-2y$	✓ factorise
	$8-y=-3y$ *or* $8-y=-2y$	✓ solve
	$2y=-8$ *or* $y=-8$	
	$y=-4$ *or* $y=-8$	✓ both y values
	$x=12$ *or* $x=16$	✓ both x values (6)

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1.3	$\frac{1}{a}+\frac{1}{b}=\frac{b+a}{ab}$ $a=b^2-1$ $=(b+1)(b-1)$ *from*: $a^2=b(b+1)$ $a(b+1)(b-1)=b(b+1)$ $\therefore a(b-1)=b$ $\therefore ab=b+a$ $\frac{1}{a}+\frac{1}{b}=\frac{b+a}{b+a}=1$	✓ a ✓ sub ✓ simplify ✓ answer (4)
		[24]

QUESTION 2/*VRAAG* 2

2.1.1	$2k-7 \quad k+8 \quad 2k-1$ $-k+15 \quad k-9$ $-k+15=k-9$ $-2k=-24$ $k=12$	✓ first diff ✓ equate ✓ answer (3)
2.1.2	$20 \quad 26 \quad 32 \quad ...$ $S_{30}=\frac{30}{2}[2(20)+(30-1)(6)]$ $=3210$ **OR** $20 \quad 26 \quad 32 \quad ...$ $T_{30}=20+(30-1)(6)$ $=194$ $S_{30}=\frac{30}{2}[20+194]$ $=3210$	✓ new sequence ✓ *a* and *d* ✓ sub ✓ answer **OR** ✓ new sequence ✓ *a* and *l* ✓ sub ✓ answer (4)

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2.2.1	$\frac{a}{1-\frac{1}{2}}=6$ $\frac{a}{\frac{1}{2}}=6$ $a=3$ $T_7=3\left(\frac{1}{2}\right)^6$ $=\frac{3}{64}$	✓ sub ✓ a ✓ sub ✓ answer	(4)
2.2.2	$n=p-2+1$ $n=p-1$ $\frac{\frac{3}{2}\left(\left(\frac{1}{2}\right)^{p-1}-1\right)}{\left(\frac{1}{2}\right)-1}=\frac{45}{16}$ $\left(\frac{1}{2}\right)^{p-1}-1=-\frac{15}{16}$ $\left(\frac{1}{2}\right)^{p-1}=\frac{1}{16}$ $\left(\frac{1}{2}\right)^{p-1}=\left(\frac{1}{2}\right)^4$ $p=5$	✓ n ✓ $r=\frac{1}{2}$ ✓ sub ✓ simplify ✓ answer	(5)

2.2.3	$\sum_{k=2}^{20} 3(2)^{1-k} = m$ $\frac{3}{2}+\frac{3}{4}+\frac{3}{8}+....+\frac{3}{2^{19}} = m$ $\sum_{k=2}^{20} 24(2)^{-k} = 6+3+\frac{3}{2}+....+\frac{24}{2^{20}}$ $= 4\left(\frac{3}{2}+\frac{3}{4}+\frac{3}{8}+....+\frac{3}{2^{19}}\right)$ $= 4m$ OR $\sum_{k=2}^{20} 3(2)^{1-k} = m$ $\sum_{k=2}^{20} 6(2)^{-k} = m$ $\sum_{k=2}^{20} 24(2)^{-k} = 4m$ OR $\sum_{k=2}^{20} 24(2)^{-k} = \sum_{k=2}^{20} 4\text{x}3\text{x}2(2)^{-k}$ $= 4\sum_{k=2}^{20} 3\text{x}2(2)^{-k}$ $= 4\sum_{k=2}^{20} 3(2)^{1-k} = 4m$ OR	✓ expand ✓ expand ✓ answer ✓ $\sum_{k=2}^{20} 6(2)^{-k} = m$ ✓ $\sum_{k=2}^{20} 4\text{x}6(2)^{-k}$ ✓ answer ✓ $\sum_{k=2}^{20} 4\text{x}3\text{x}2(2)^{-k}$ ✓ $4\sum_{k=2}^{20} 3\text{x}2(2)^{-k}$ ✓ answer ✓ sub and answer

	$\frac{\frac{3}{2}\left(\left(\frac{1}{2}\right)^{20}-1\right)}{\left(\frac{1}{2}\right)-1}=3=m$ $\frac{6\left(\left(\frac{1}{2}\right)^{20}-1\right)}{\left(\frac{1}{2}\right)-1}=12$ $12=4\text{x}3=4m$	✓ sub and answer ✓ answer (3)
		[19]

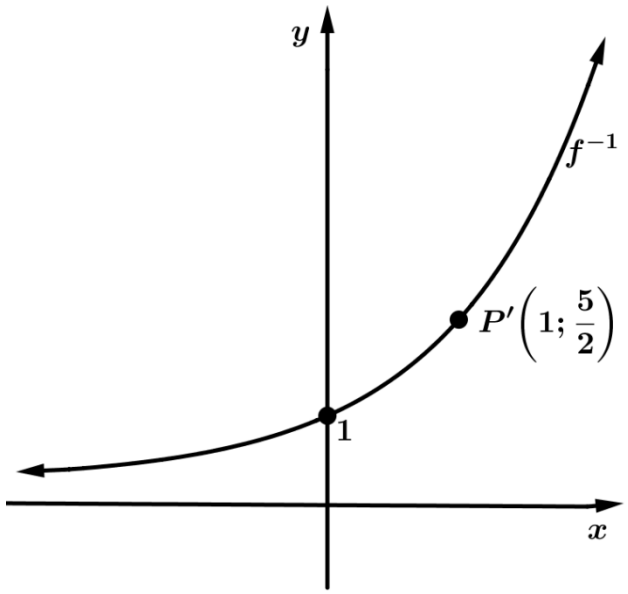
QUESTION 3/*VRAAG* 3

3.1	$-14 \quad 0 \quad 10 \quad 16$ $14 \quad 10 \quad 6$ $-4 \quad -4$ $2a=-4 \quad 3(-2)+b=14 \quad -2+20+c=-14$ $a=-2 \quad b=20 \quad c=-32$ $T_n=-2n^2+20n-32$	✓ a ✓ b ✓ c (3)
3.2	$-2n^2+20n-32<-110$ $-2n^2+20n+78<0$ $n^2-10n-39>0$ $(n+3)(n-13)>0$ $n<-3$ or $n>13$ $\therefore n>13$	✓ $T_n<-110$ ✓ std form ✓ factors ✓ selection (4)
		[7]

QUESTION 4/*VRAAG 4*

4.1	$1=\log_a \frac{5}{2}$ $a=\frac{5}{2}$	✓ sub ✓ answer (2)
4.2	$K(1;0)$	✓✓ answer (2)
4.3	$x=\log_{\frac{5}{2}} y$ $y=\left(\frac{5}{2}\right)^x$ or $x=\left(\frac{5}{2}\right)^y$ $y=\left(\frac{5}{2}\right)^x$	✓ swop x and y ✓ expo form ✓ expo form ✓ swop x and y (2)

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4.4		✓ intercept ✓ asymptote ✓ shape (3)
4.5	$-3 < x \leq -\frac{1}{2}$	✓✓ answer (2)
		[11]

QUESTION 5/*VRAAG 5*

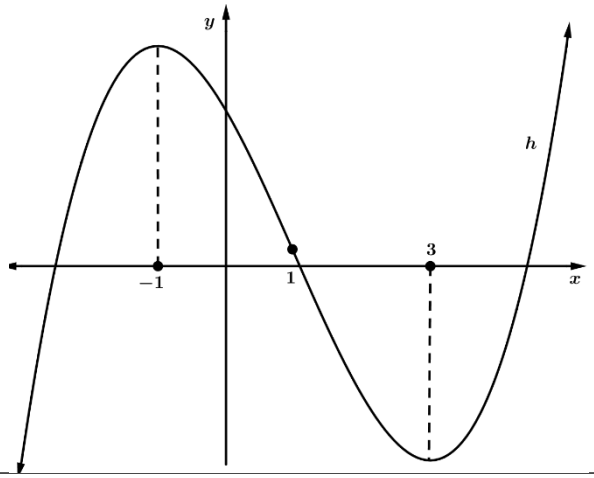
5.1	$A(0;-7)$	✓ x ✓ y	(2)
5.2	$x-7=-x+1$ $2x=8$ $x=4$ $y=-3$ $C(4;-3)$ $f(x)=\frac{a}{x-4}-3$ $-7=\frac{a}{0-4}-3$ $-4=\frac{a}{-4}$ $a=16$	✓ equate ✓ x ✓ y ✓ sub into equn ✓ a	(5)
5.3	$x>4$	✓ answer	(1)
5.4	$x-7=\frac{16}{x-4}-3$ $x-4=\frac{16}{x-4}$ $x^2-8x+16=16$ $x(x-8)=0$ $x=0$ *or* $x=8$ $A(0;-7)$ $B(8;\ 1)$ $\text{AB}=\sqrt{(0-8)^2+(-7-1)^2}$ $=8\sqrt{2}$	✓ equate ✓ coord of B ✓ sub ✓ answer	(4)
			[12]

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QUESTION 6/*VRAAG 6*

6.1	$x^2 - 2x - 3 = 0$ $(x+1)(x-3) = 0$ $x = -1 \ \ or \ \ x = 3$ AB = 4	✓ y = 0 ✓ answer	(2)
6.2	$x = -\frac{-2}{2(1)}$ $x = 1$ $y = (1)^2 - 2(1) - 3$ $y = -4$ $C(1;-4)$	✓ sub ✓ *x* value ✓ *y* value	(3)
6.3	$KM = -2x + 1 - (x^2 - 2x - 3)$ $= -x^2 + 4$ $x = -\frac{(0)}{2(-1)}$ $x = 0$ $KM_{\max} = -(0)^2 + 4$ $= 4$ OR $KM = -2x + 1 - (x^2 - 2x - 3)$ $= -x^2 + 4$ $f'(x) = -2x$ $-2x = 0$ $x = 0$ $KM_{\max} = -(0)^2 + 4$ $= 4$	✓ *f(x)–g(x)* ✓ simplify ✓ *x* ✓ answer ✓ *f(x)–g(x)* ✓ simplify ✓ *x* ✓ answer	(4) (4)
6.4	$x < -1$ or $x > 3$	✓ $x < -1$ ✓ $x > 3$	(2)

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6.5		✓ shape ✓✓ tps ✓ concavity (4)
		[15]

QUESTION 7/*VRAAG 7*

7.1.1	$1+i_{eff}=\left(1+\frac{9,35}{400}\right)^4$ $\therefore\ i_{eff}=\left(1+\frac{9,35}{400}\right)^4-1$ $\frac{r}{100}=0,096829$ $\therefore\quad r=9,68\%$	✓ i ✓ sub ✓ answer (3)
7.1.2	$A=50\ 000\left(1+\frac{0,0935}{4}\right)^{24}$ $=$ R87 057,32 OR $A=50\ 000\left(1+\frac{9,68}{100}\right)^6$ $=$ R87 043,16	✓ sub ✓ answer ✓ sub ✓ answer (2)

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7.2.1	$800\ 000 = \dfrac{10\ 000\left[1-\left(1+\dfrac{14}{1200}\right)^{-n}\right]}{\left(\dfrac{14}{1200}\right)}$ $\dfrac{14}{15} = 1-\left(1+\dfrac{14}{1200}\right)^{-n}$ $\left(1+\dfrac{14}{1200}\right)^{-n} = \dfrac{1}{15}$ $-n = \log_{\left(1+\frac{14}{1200}\right)}\dfrac{1}{15}$ $-n = -233,4699$ $n = 233,4699$ 233 withdrawals of R10 000	✓ ✓ ✓ ✓ ✓	i sub into Pv logs answer withdrawals	(5)
7.2.2a	$n = 185,4699$ $Pv = \dfrac{10\ 000\left[1-\left(1+\dfrac{14}{1200}\right)^{-185,4699}\right]}{\left(\dfrac{14}{1200}\right)}$ $= R757\ 428$ **OR** $Fv = \dfrac{10\ 000\left[\left(1+\dfrac{14}{1200}\right)^{48}-1\right]}{\left(\dfrac{14}{1200}\right)}$ $= R638\ 577,36$ $A = 800\ 000\left(1+\dfrac{14}{1200}\right)^{48} = R1\ 396\ 005,54$ $A - Fv = R757\ 428$	✓ ✓ ✓ ✓ ✓	n sub answer n sub into both formula answer	(3)
7.2.2b	House Price $= 757\ 428 \times \frac{100}{30}$ $= R2\ 524\ 760$	 ✓	 answer	(1)
			[14]

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QUESTION 8/*VRAAG 8*

8.1	$f(x)=x^2+x$ $f(x+h)=(x+h)^2+(x+h)$ $=x^2+2xh+h^2+x+h$ $f(x+h)-f(x)=2xh+h^2+h$ $f'(x)=\lim\limits_{h\to 0}\dfrac{2xh+h^2+h}{h}$ $=\lim\limits_{h\to 0}\dfrac{h(2x+h+1)}{h}$ $=\lim\limits_{h\to 0}(2x+h+1)$ $=2x+1$ OR $f'(x)=\lim\limits_{h\to 0}\dfrac{(x+h)^2+(x+h)-(x^2+x)}{h}$ $=\lim\limits_{h\to 0}\dfrac{x^2+2xh+h^2+x+h-x^2-x}{h}$ $=\lim\limits_{h\to 0}\dfrac{2xh+h^2+h}{h}$ $=\lim\limits_{h\to 0}\dfrac{h(2x+h+1)}{h}$ $=\lim\limits_{h\to 0}(2x+h+1)$ $=2x+1$	➢ $f(x+h)$ ➢ simplify ➢ sub ➢ factorise ➢ answer ➢ $f(x+h)$ ➢ $f(x+h)-f(x)$ ➢ simplify ➢ factorise ➢ answer (5)
8.2.1	$D_x\left[-x^5+2x^{-3}-5m^3\right]$ $=-5x^4-6x^{-4}$	✓ $-5x^4$ ✓ $-6x^{-4}$ ✓ 0 (3)

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8.2.2	$y=\sqrt[4]{16x^3}+\frac{3}{x^2}$ $y=2x^{\frac{3}{4}}+3x^{-2}$ $\frac{dy}{dx}=\frac{3}{2}x^{-\frac{1}{4}}-6x^{-3}$	✓✓ ✓✓	(4)
			[12]

QUESTION 9/*VRAAG 9*

9.1	$R(0;-25)$	☞ answer	(1)
9.2	$f(x)=-(x-5)^2(x-P)$ $-25=-(0-5)^2(0-P)$ $-25=25P$ $P=-1$ $f(x)=-(x-5)^2(x+1)$ $=-(x^2-10x+25)(x+1)$ $=-x^3+9x^2-15x-25$ OR $d=-25$ (y-intercept) $-(5)^3+b(5)^2+c(5)-25=0$ $25b+5c=150$ $5b+c=30$ ...1 $-3(5)^2+2b(5)+c=0$ $10b+c=75$ ...2 $2-1$: $5b=45$ $b=9$ *sub* into 1 or 2 $c=-15$	✓ sub roots ✓ sub R ✓ P ✓ expansion ✓ f(5) = 0 ✓ ✓ f'(5) = 0 ✓ solve	(4) (4)

9.3	$f'(x) = -3x^2 + 18x - 15$ $-3x^2 + 18x - 15 = 0$ $x^2 - 6x + 5 = 0$ $(x-5)(x-1) = 0$ $x = 5 \quad or \quad x = 1$ $y = 0 \qquad y = -32$ $S(1;-32)$	✓ $f'(x)$ ✓ =0 ✓ select x ✓ y value (4)

9.4	$m_T = -3x^2 + 18x - 15$ at tangential or intersection point $ax^3 + bx^2 + cx + d = mx + c$ $-x^3 + 9x^2 - 15x - 25 = \left(-3x^2 + 18x - 15\right)x - 25$ $-x^3 + 9x^2 - 15x - 25 = -3x^3 + 18x^2 - 15x - 25$ $2x^3 - 9x^2 = 0$ $x^2(2x - 9) = 0$ $x \neq 0 \; or \; x = \frac{9}{2}$ (not point R) $f\left(\frac{9}{2}\right) = -\frac{11}{8}$ $Q\left(\frac{9}{2}; -\frac{11}{8}\right)$	✓ gradient as m ✓ equate ✓ select x value ✓ y value (4)

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QUESTION 10/*VRAAG 10*

10.1	$A(35)=\dfrac{600+40(35)-(35)^2}{1200}$ $=0,65$	☞ sub ☞ answer (2)
10.2	$A(x)=\dfrac{600+40x-x^2}{1200}$ $=\dfrac{1}{2}+\dfrac{1}{30}x-\dfrac{1}{1200}x^2$ $A'(x)=\dfrac{1}{30}-\dfrac{1}{600}x$ $\dfrac{1}{30}-\dfrac{1}{600}x=0$ $\dfrac{1}{600}x=\dfrac{1}{30}$ $x=20$	✓ simplify ✓ $A'(x)$ ✓ $=0$ ✓ answer (4)
10.3	$P(A \text{ and } C)=P(A)$ x P(C) $=\left(\dfrac{600+40(20)-(20)^2}{1200}\right)\left(0,9-\dfrac{20}{100}\right)$ $=\left(\dfrac{5}{6}\right)\left(\dfrac{7}{10}\right)$ $=\dfrac{35}{60}$	✓ sub ✓ answer (2)
		[8]

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QUESTION 11/*VRAAG 11*

11.1.1	$d = 5$ $e = 4$ $f = 7$ $g = 5$	✓ d ✓ e ✓ f ✓ g (4)
11.1.2	$\frac{43}{54}$ or 0,7963 or 79,63%	✓ 43 ✓ 54 (2)
11.2.1	$10! = 3\,628\,800$	✓ answer (1)
11.2.2	3! x 7! = 30240	✓ 3! ✓ 7! (2)
11.2.3	10 x 9 x 8 = 720	✓✓ answer (2)
11.2.4	Probability consecutive $= \frac{2! \times 9!}{10!}$ $= \frac{1}{5}$ P(GH') $= 1 - \frac{1}{5}$ $= \frac{4}{5}$ OR GH consecutive $= 9! \times 2!$ not consecutive $= 10! - 9! \times 2!$ Probability $= \frac{10! - 9! \times 2!}{10!}$ $= \frac{4}{5}$	✓ 9! x 2! ✓ 10! in denom ✓ $1 - \frac{1}{5}$ ✓ answer (4) ✓ 9! x 2! ✓ $10! - 9! \times 2!$ ✓ 10! in denom ✓ answer (4)
		[15]