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GRADE/GRAAD 12

JUNE/JUNIE 2022

**MATHEMATICS P1 MARKING GUIDELINE/
WISKUNDE V1 NASIENRIGLYN**

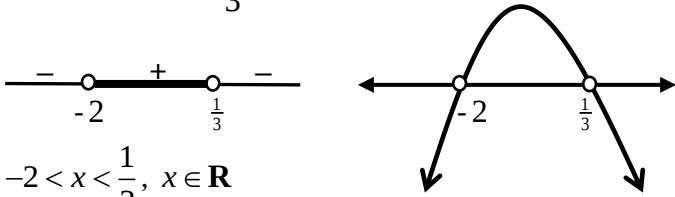
MARKS/PUNTE: 150

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 marking guideline.
Volgehoue akkuraatheid geld deurgaans in ALLE aspekte van die nasienriglyn.
- 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 1/VRAAG 1

1.1.1	$x^2 = -4x$ $x^2 + 4x = 0$ $x(x + 4) = 0$ $x = 0$ or/of $x + 4 = 0$ $x = 0$ or/of $x = -4$ OR / OF $x^2 + 4x = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-4 \pm \sqrt{(4)^2 - 4(1)(0)}}{2(1)}$ $x = 0$ or / of $x = -4$	Answers only – Full marks Slegs antwoorde – Volpunte	✓ standard form / <i>standaardvorm</i> ✓ factors / <i>faktore</i> ✓ both answers / <i>beide antwoorde</i> OR / OF ✓ standard form / <i>standaardvorm</i> ✓ correct substitution into correct formula / <i>korrekte vervanging in korrekte formule</i> ✓ both answers / <i>beide antwoorde</i> (3)
1.1.2	$x^2 + x - 1 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(1) \pm \sqrt{(1)^2 - 4(1)(-1)}}{2(1)}$ $x = \frac{-1 \pm \sqrt{5}}{2}$ $\therefore x = 0,62$ or/of $x = -1,62$	Penalise 1 mark for incorrect rounding off./ <i>Penaliseer 1 punt vir verkeerde afronding.</i>	✓ substitution / <i>vervanging</i> ✓✓ <i>x-values / waardes</i> (3)

1.1.3	$\sqrt{x+4} - \frac{4}{\sqrt{x-2}} = 0$ $\sqrt{x+4} = \frac{4}{\sqrt{x-2}}$ $(\sqrt{x+4})^2 = \left(\frac{4}{\sqrt{x-2}}\right)^2$ $x+4 = \frac{16}{x-2}$ $(x+4)(x-2) = 16$ $x^2 + 2x - 24 = 0$ $(x+6)(x-4) = 0$ $\therefore x \neq -6 \text{ or / of } x = 4$	✓ isolating surd / isoleer wortelvorm ✓ square both sides / kwadreer beide kante ✓ standard form / standaardvorm ✓ factors / faktore ✓ selection / keuse (5)
1.1.4	$(x+2)(-3x+1) > 0$ critical values/kritieke waardes $x = -2$ or/of $x = \frac{1}{3}$  $-2 < x < \frac{1}{3}, x \in \mathbf{R}$ OR/OF $x \in \left(-2; \frac{1}{3}\right), x \in \mathbf{R}$	✓ critical values / kritieke waardes ✓✓ $-2 < x < \frac{1}{3}$ (accuracy / akkuraatheid) OR/OF $x \in \left(-2; \frac{1}{3}\right)$ (3)

1.3	$9x^2 - 12px + 4p^2 = 0$ For equal roots/ <i>Vir gelyke wortels</i> : $\Delta = 0$ $\therefore b^2 - 4ac = 0$ $(-12p)^2 - 4(9)(4p^2) = 0$ $144p^2 - 144p^2 = 0$ $0 = 0$ $\Rightarrow$ For all Real values / <i>Vir alle Reële waardes</i> $p \in \mathbb{R}$	✓ standard form / <i>standaardvorm</i> ✓ $\Delta = 0$ ✓ answer / <i>antwoord</i> ✓ conclusion / <i>gevolgtrekking</i>
		(4)
		[24]

QUESTION 2/VRAAG 2

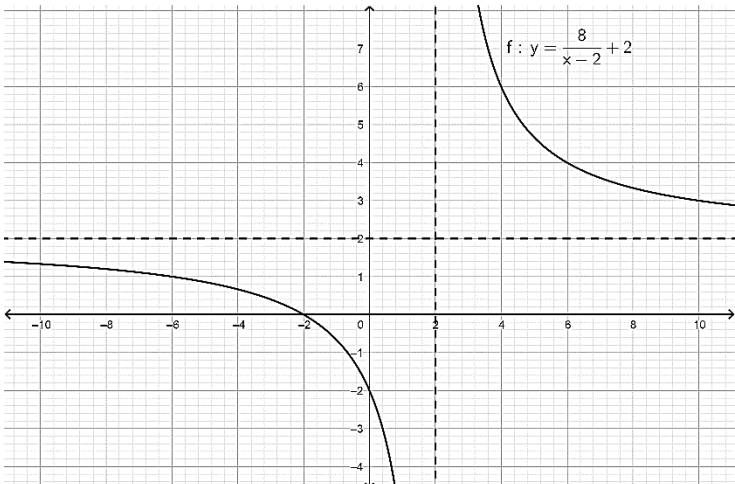
2.1.1	$r = \frac{T_3}{T_2} = \frac{18}{9} = 2$	✓ answer / antwoord (1)
2.1.2	$T_n = a \cdot r^{n-1}$ $2304 = \left(\frac{9}{2}\right)(2)^{n-1}$ $2^{n-1} = 512$ $= 2^9$ $\therefore n-1 = 9$ $n = 10$	✓ substitution / vervanging ✓ answer / antwoord (2)
2.2	$S_\infty = \frac{a}{1-r}$ $12 = \frac{6}{1-m}$ $12 - 12m = 6$ $-12m = -6$ $m = \frac{1}{2}$	✓ substitution / vervanging ✓ answer / antwoord (2)
2.3	$\frac{T_5}{T_3} = \frac{ar^4}{ar^2} = \frac{162}{18}$ $r^2 = 9$ $r = \pm 3$ $a \cdot (-3)^2 = 18$ $a = 2$ $S_7 = \frac{2((-3)^7 - 1)}{-3 - 1}$ $= 1094$	✓ setting up both equations opstel van beide vergelykings ✓ value(s) of r / waarde(s) van r ✓ value of a / waarde van a ✓ substitution into S_n / vervanging in S_n ✓ answer / antwoord (5)
2.4.1	$T_1 = 8 \text{ and / en } t_n = 4n - 2$ $t_1 = 4(1) - 2 = 2$ $t_2 = 4(2) - 2 = 6$ $\therefore T_2 = 10 ; T_3 = 16$	✓ finding t_1 and t_2 / berekening van t_1 en t_2 ✓ $T_2 = 10$ ✓ $T_3 = 16$ (3)

2.4.2	$\begin{array}{ccccccc} 8 & & 10 & & 16 & & 26 \\ & ; & & ; & & ; & \\ & 2 & & 6 & & & 10 \\ & & & 4 & & 4 & \end{array}$ $\begin{array}{l} 2a = 4 \quad 3a + b = 2 \quad a + b + c = 8 \\ a = 2 \quad 3(2) + b = 2 \quad (2) + (-4) + c = 8 \\ \quad \quad \quad b = -4 \quad \quad \quad c = 10 \\ \therefore T_n = 2n^2 - 4n + 10 \end{array}$ OR/OF $\begin{array}{l} T_n = T_1 + s_{n-1} \\ = 8 + \frac{n-1}{2}(2(2) + (n-2)4) \\ = 8 + \frac{n-1}{2}(4n-4) \\ = 8 + (n-1)(2n-2) \\ = 8 + 2n^2 - 4n + 2 \\ = 2n^2 - 4n + 10 \end{array}$	✓ value of a / waarde van a ✓ value of b / waarde van b ✓ value of c / waarde van c (3) OR/OF ✓ method / metode ✓ simplification / vereenvoudiging ✓ answer / antwoord (3)
2.4.3	$\begin{array}{l} 2n^2 - 4n + 10 = 3050 \\ 2n^2 - 4n - 3040 = 0 \\ n^2 - 2n - 1520 = 0 \\ (n-40)(n+38) = 0 \\ n = 40 \text{ or / of } n \neq -38 \end{array}$	✓ equating / gelyk stel ✓ factors / faktore ✓ selection / keuse ($n = 40$) (3)
		[19]

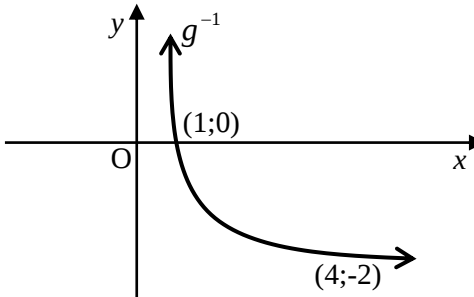
QUESTION 3/VRAAG 3

3.1	$\text{Area } \Delta_1 = \frac{1}{2} b \times h$ $= \frac{1}{2} (4)(1)$ $= 2 \text{ units}^2 / \text{eenhede}^2$	✓ answer / antwoord (1)
3.2	$\text{Area } \Delta_{26} = \frac{1}{2} b \times h$ $= \frac{1}{2} (4)(26)$ $= 52 \text{ units}^2 / \text{eenhede}^2$	✓ $h = 26$ ✓ answer / antwoord (2)
3.3	<i>Area of rectangle/Area van reghoek</i> $= l \times b$ $= 104 \times 26$ $= 2704 \text{ units}^2 / \text{eenhede}^2$ <i>Sum of Areas of Triangles / Som van Areas van Driehoeke</i> $= \frac{26}{2} [2 + 52]$ $= 702 \text{ units}^2 / \text{eenhede}^2$ <i>Area of unshaded part / Area van nie – gearseerde deel</i> $= 2704 - 702$ $= 2002 \text{ units}^2 / \text{eenhede}^2$	✓ answer / antwoord ✓ substitution / vervanging ✓ answer / antwoord ✓ method / metode ✓ answer / antwoord (5)
		[8]

QUESTION 4/VRAAG 4

4.1	$x \in \mathbb{R}; x \neq 2$	✓✓ answer / antwoord (2)
4.2	$y = \frac{8}{0-2} + 2 = -2$	✓ answer / antwoord (1)
4.3	$\frac{8}{x-2} + 2 = 0$ $\frac{8}{x-2} = -2$ $-2x + 4 = 8$ $-2x = 4$ $x = -2$	✓ equating to 0 / stel gelyk aan 0 ✓ answer / antwoord (2)
4.4		✓ both intercepts / beide afsnitte ✓ asymptotes / asimptote ✓ shape / vorm (3)
4.5	$y = -(x-2) + 2$ $y = -x + 4$ $\therefore k = 4$ OR / OF $y = -x + k$ $2 = -2 + k$ $\therefore k = 4$	✓ substitution / vervanging ✓ answer / antwoord (2)
4.6	$y = \frac{8}{(x-5)} + 2$ $y = -\left[\frac{8}{(x-5)} + 2\right]$ $y = -\frac{8}{(x-5)} - 2$	✓ shift 3 units to the right skuif 3 eenhede na regs ✓ reflection in the x-axis refleksie in die x-as ✓ answer / antwoord (3)
		[13]

QUESTION 5/VRAAG 5

5.1	$x = -1$	✓ answer / antwoord (1)
5.2	$R(-1; -8)$	✓ answer / antwoord (1)
5.3	$2(x+1)^2 - 8 = 0$ $(x+1)^2 = 4$ $x+1 = \pm 2$ $\therefore x = 1$ or / of $x = -3$ $P(-3;0)$ and / en $Q(1;0)$ OR / OF $2(x+1)^2 - 8 = 0$ $2(x^2 + 2x + 1) - 8 = 0$ $2x^2 + 4x - 6 = 0$ $x^2 + 2x - 3 = 0$ $(x-1)(x+3) = 0$ $x = 1$ or / of $x = -3$ $P(-3;0)$ and / en $Q(1;0)$	✓ equating to 0 / gelyk stel aan 0 ✓ simplification / vereenvoudiging ✓ x-values / x-waardes ✓ coordinates / koördinate OR / OF ✓ equating to 0 / gelyk stel aan 0 ✓ standard form / standaardvorm ✓ factors / faktore ✓ coordinates / koördinate (4)
5.4	$g: y = \left(\frac{1}{2}\right)^x$ $g^{-1}: x = \left(\frac{1}{2}\right)^y$ $\therefore g^{-1}: y = \log_{\frac{1}{2}} x$ Answer only – Full marks Slegs antwoord – Volpunte	✓ interchanging x and y omruil van x en y ✓ answer / antwoord (2)
5.5		✓ x-intercept / x-afsnit ✓ other point / ander punt ✓ shape / vorm (3)

5.6.1	$0 < x \leq 4$ OR / OF $x \in (0; 4]$	✓ ✓ answer / antwoord (2)
5.6.2	$x < -3$ or / of $0 < x < 1$ OR / OF $(0; -3) \cup (0; 1)$	✓ $x < -3$ ✓ $0 < x < 1$ ✓ $\cup$ / or / of (3)
		[16]

QUESTION 6/VRAAG 6

6.1	$A = P(1 + in)$ $100\,000 = 50\,000(1 + 0,085n)$ $2 = 1 + 0,085n$ $1 = 0,085n$ $\therefore n = 11,7647\dots$ $n = 11 \text{ years / jaar } 10 \text{ months / maande}$ (since: $0,7647\dots \times 12 = 9,17 \text{ months we round up}$)	✓ substitution / vervanging ✓ simplification / vereenvoudiging ✓ value of n / waarde van n ✓ answer / antwoord (4)
6.2	$A = P(1 - i)^n$ $A = 24\,000(1 - 0,18)^3$ $A = R13\,232,83$	✓ formula / formule ✓ substitution / vervanging ✓ answer / antwoord (3)
6.3	$x \left(1 + \frac{12\%}{12} \right)^{84} + 2x \left(1 + \frac{12\%}{12} \right)^{48} = R276\,558,75$ $x \left[\left(1 + \frac{12\%}{12} \right)^{84} + 2 \left(1 + \frac{12\%}{12} \right)^{48} \right] = 276\,558,75$ $x = \frac{276\,558,75}{\left(1 + \frac{12\%}{12} \right)^{84} + 2 \left(1 + \frac{12\%}{12} \right)^{48}}$ $x = R50\,000,00$	✓ 84 ✓ 48 ✓ $x \left(1 + \frac{12\%}{12} \right)^{84} + 2x \left(1 + \frac{12\%}{12} \right)^{48} = R276\,558,75$ ✓ common factor x / gemene faktor x ✓ $x = \frac{276\,558,75}{\left(1 + \frac{12\%}{12} \right)^{84} + 2 \left(1 + \frac{12\%}{12} \right)^{48}}$ ✓ answer / antwoord (6)
		[13]

QUESTION 7/VRAAG 7

Penalise 1 mark for incorrect notation in this question
 Penaliseer 1 punt vir verkeerde notasie in hierdie vraag

7.1	$f(x) = -2x^2 + x$ $f(x+h) = -2(x+h)^2 + (x+h)$ $= -2x^2 - 4xh - 2h^2 + x + h$ $\frac{f(x+h) - f(x)}{h} = \frac{-2x^2 - 4xh - 2h^2 + x + h - (-2x^2 + x)}{h}$ $= \frac{-4xh - 2h^2 + h}{h}$ $= \frac{h(-4x - 2h + 1)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} (-4x - 2h + 1)$ $= -4x + 1$ Answer ONLY: 0 marks SLEGS antwoord: 0 punte	✓ $-2x^2 - 4xh - 2h^2 + x + h$ ✓ substitution / vervanging ✓ simplification / vereenvoudiging ✓ factorisation / faktorisering (dividing by h / deel deur h) ✓ answer / antwoord (5)
7.2.1	$D_x \left[5\sqrt{x} - \frac{x^5}{5} \right]$ $D_x \left[5x^{\frac{1}{2}} - \frac{1}{5}x^5 \right]$ $= \frac{5}{2}x^{-\frac{1}{2}} - x^4$	✓ $5x^{\frac{1}{2}}$ ✓ $\frac{5}{2}x^{-\frac{1}{2}}$ ✓ $-x^4$ (3)
7.2.2	$\frac{d}{dx} \left[\left(x + \frac{2}{x} \right) \left(x - \frac{2}{x} \right) \right]$ $\frac{d}{dx} \left[x^2 - \frac{4}{x^2} \right]$ $\frac{d}{dx} [x^2 - 4x^{-2}]$ $= 2x + 8x^{-3}$	✓ $x^2 - \frac{4}{x^2}$ ✓ $-4x^{-2}$ ✓ $2x$ ✓ $+8x^{-3}$ (4)
		[12]

QUESTION 8/VRAAG 8

8.1	$f'(x) = 3x^2 + 2bx + c$ $2b = -10$ $b = -5$ $c = -8$ $f(x) = x^3 - 5x^2 - 8x + d$ $f(2) = (2)^3 - 5(2)^2 - 8(2) + d = -16$ $8 - 20 - 16 + d = -16$ $\therefore d = 12$	$\checkmark f'(x) = 3x^2 + 2bx + c$ $\checkmark 2b = -10$ $\checkmark c = -8$ $\checkmark$ substitution of point (2 ; -16) <i>vervanging van punt (2 ; -16)</i> (4)
8.2	$f'(x) = 3x^2 - 10x - 8 = 0$ $(3x + 2)(x - 4) = 0$ $x = -\frac{2}{3}$ or / of $x = 4$ $y = \frac{400}{27}$ or / of $y = -36$ $L\left(-\frac{2}{3}; \frac{400}{27}\right)$ & $M(4; -36)$	$\checkmark f'(x) = 0$ $\checkmark$ factors / <i>faktore</i> $\checkmark$ x-values / <i>x-waardes</i> $\checkmark$ y-values / <i>y-waardes</i> $\checkmark$ correct coordinates / <i>korrekte koördinate</i> (5)
8.3	$m = \frac{0+16}{6-2} = 4$ $y - y_1 = m(x - x_1)$ $y - 0 = 4(x - 6)$ $y = 4x - 24$ OR / OF $m = \frac{0+16}{6-2} = 4$ $y = mx + c$ $y = 4x + c$ $-16 = 4(2) + c$ $\therefore c = -24$ $y = 4x - 24$	$\checkmark$ gradient / <i>gradiënt</i> $\checkmark$ substitution / <i>vervanging</i> $\checkmark$ answer / <i>antwoord</i> OR / OF $\checkmark$ gradient / <i>gradiënt</i> $\checkmark$ substitution / <i>vervanging</i> $\checkmark$ answer / <i>antwoord</i> (3)

8.4	$y = 4x - 24$ $-36 = 4x - 24$ $-12 = 4x$ $\therefore x = -3$ $\Rightarrow AM = 7 \text{ units / eenhede}$	✓ substitution of $(x ; -36)$ / <i>vervanging van $(x ; -36)$</i> ✓ $x = -3$ ✓ answer / antwoord (3)
8.5.1	$\left(-\infty; -\frac{2}{3}\right) \cup (4; \infty)$	✓✓ answer / antwoord (2)
8.5.2	$f''(x) = 6x - 10 = 0$ $\therefore x = \frac{5}{3}$ $\Rightarrow \text{Concave down / Konkaaf af : } x < \frac{5}{3}$	✓ method / metode ✓ answer / antwoord (2)
		[19]

QUESTION 9/VRAAG 9

9.1	$x + h = 10 \Rightarrow h = (10 - x) \text{ m}$ Let width of rectangle = y / <i>Laat die breedte van reghoek = y</i> $\therefore 2x + 2y = 32$ $y = (16 - x) \text{ m}$ Area of figure / <i>Oppervlakte van figuur :</i> = Area of Triangle + Area of Rectangle <i>(Oppervlakte van Driehoek + Oppervlakte van Reghoek)</i> $= \frac{1}{2}(b \times h) + (l \times b)$ $= \frac{1}{2}(x)(10 - x) + x(16 - x)$ $= 5x - \frac{1}{2}x^2 + 16x - x^2$ $= -\frac{3}{2}x^2 + 21x$	✓ $h = (10 - x)$ ✓ $y = (16 - x)$ ✓ $\frac{1}{2}(x)(10 - x)$ ✓ $x(16 - x)$ ✓ simplification / vereenvoudiging (5)
9.2	$A'(x) = -3x + 21 = 0$ $-3x = -21$ $x = 7$	✓ $A'(x) = -3x + 21$ ✓ $A'(x) = 0$ ✓ answer / antwoord (3)
9.3	$A = -\frac{3}{2}(7)^2 + 21(7)$ $= 73,5 \text{ m}^2$	✓ substitution / vervanging ✓ answer / antwoord (2)
		[10]

QUESTION 10/VRAAG 10

10.1.1	$a = 450$ $b = 319$ $c = 298$ $d = 748$	✓ value of a / waarde van a ✓ value of b / waarde van b ✓ value of c / waarde van c ✓ value of d / waarde van d	(4)
10.1.2	$P(F / \text{Not}) = \frac{298}{1530}$	✓✓ answer / antwoord	(2)
10.2			
10.2.1	$\frac{12}{22} \times \frac{11}{21} = \frac{2}{7} \approx 0,29$	✓ answer / antwoord	(2)
10.2.2	$\left(\frac{10}{22} \times \frac{12}{21}\right) + \left(\frac{12}{22} \times \frac{10}{21}\right)$ $= \frac{40}{77} \approx 0,52$	✓ $\left(\frac{10}{22} \times \frac{12}{21}\right)$ ✓ $\left(\frac{12}{22} \times \frac{10}{21}\right)$ ✓ answer / antwoord	(3)

10.3.1	$P(M) \times P(N)$ $= (0,12 + x)(0,57)$ $= 0,57x + 0,0684$ For independent events/ <i>Vir onafhanklike gebeurtenisse</i> $P(M) \times P(N) = P(M \cap N)$ $0,57x + 0,0684 = 0,12$ $0,57x = 0,0516$ $x = 0,09$	✓ $0,57x + 0,0684$ ✓ $0,57x + 0,0684 = 0,12$ ✓ answer / <i>antwoord</i> (3)
10.3.2	$y = 1 - (0,09 + 0,12 + 0,45)$ $= 0,34$	✓ $1 - (0,09 + 0,12 + 0,45)$ ✓ answer / <i>antwoord</i> (2)
		[16]
		TOTAL/TOTAAL: 150