

Name of School

Gr 12

**Mathematics P1/
Wiskunde V 1
September 2020**

Marking guideline / Nasienriglyne

MARKS / PUNTE: 150

**These marking guidelines consist of 10 pages.
*Hierdie nasienriglyne bestaan uit 10 bladsye.***

NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent Accuracy (CA) applies in all aspects of the marking memorandum.
- Only penalise ONCE for rounding in Question 1.1.2
- B/D = Break down. Do not mark any further.

LET WEL:

- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk slegs die EERSTE poging.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die nasienriglyne van toepassing.*
- *Penaliseer slegs EEN keer vir afronding in Vraag 1.1.2*
- *B/D Moenie verder merk nie.*

QUESTION 1 / VRAAG 1

1.1	1.1.1	$x^2 - 6x - 27 = 0$ $(x - 9)(x + 3) = 0$ $x = 9 ; x = -3$	✓ factors/ <i>faktore</i> ✓ $x = 9$ ✓ $x = -3$ CA	(3)
	1.1.2	$2 - 4x^2 + x = 0$ $-4x^2 + x + 2 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(1) \pm \sqrt{(1)^2 - 4(-4)(2)}}{2(-4)}$ $x = \frac{-1 \pm \sqrt{33}}{-8}$ $x = -0,59 ; x = 0,84$	✓ standard form/ <i>standaard vorm</i> ✓ substitution into the correct formula /vervang korrekte formule wrong formula or subst B/D ✓ $x = -0,59$ ✓ $x = 0,84$ -1 Rounding/roning	(4)
	1.1.3	$(\sqrt{x} - 2)^2 = 1$ $x - 4\sqrt{x} + 4 = 1$ $-4\sqrt{x} = -x - 3$ $4\sqrt{x} = x + 3$ $16x = x^2 + 6x + 9$ $x^2 - 10x + 9 = 0$ $(x - 9)(x - 1) = 0$ $x = 9 ; x = 1$ OR $\sqrt{x} - 2 = \pm 1$ $\sqrt{x} - 2 = 1$ or $\sqrt{x} - 2 = -1$ $\sqrt{x} = 3$ $\sqrt{x} = 1$ $x = 9$ $x = 1$	✓ simplify/vereenvoudig ✓ squaring both sides correctly/kwadreeer beide kante CA ✓ standard form/standaard vorm ✓ factors /faktore CA ✓ both answers/ beide antwoorde CA ✓ $\sqrt{x} - 2 = +1$ ✓ $\sqrt{x} - 2 = -1$ ✓✓ simplify/vereenvoudig ✓ both answers /beide antwoorde CA	(5)
	1.1.4	$x^2 + x - 6 \geq 0$ $(x + 3)(x - 2) \geq 0$ CV: $x = -3 ; x = 2$ $x \leq -3 ; x \geq 2$ 	✓ factors /fakore ✓ critical values ✓ notation CA if factors were wrong /CA as <i>faktore verkeerd is</i>	(3)
1.2	$y = 4x + 2$ (1) $(2 + x)(x + 1) = y + 12$ (2) subst: (1) into (2): $(2 + x)(x + 1) = 4x + 2 + 12$ $(2 + x)(x + 1) = 4x + 14$ $x^2 + 3x + 2 = 4x + 14$	✓ substitution/vervanging ✓ standard form/standaard vorm	(4)	

	$x^2 - x - 12 = 0$ $(x - 4)(x + 3) = 0$ $x = 4$; $x = -3$ $y = 18$; $y = -10$	✓ both values of/beide waardes van x CA ✓ both values of/beide waardes van y CA (3)	
1.3	$10! = 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$ $= 5 \times 2 \times 3 \times 3 \times 4 \times 2 \times 7!$ $= 5 \times 4 \times 3 \times 2 \times 3 \times 2 \times 7!$ $= 5! \times 3! \times 7!$ OR $10! = 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$ $= 5 \times 2 \times 3 \times 3 \times 4 \times 2 \times 7!$ $= 6 \times 5 \times 4 \times 3 \times 2 \times 7!$ $= 6! \times 1! \times 7!$	✓ method/metode ✓✓✓ Values of/waardes van a, b, c	(4) [23]

QUESTION 2 / VRAAG 2

2.1	Sequence: 243;81;27;9.....			
	2.1.1	3	✓ answer /antwoord	(1)
	2.1.2	Yes / Ja , $r = \frac{1}{3} \therefore -1 < r < 1$	✓ yes / ja ✓ $-1 < r < 1$	(2)
	2.1.3	$T_n = ar^{n-1}$ $T_n = 243 \left(\frac{1}{3}\right)^{n-1}$ $T_n = 3^5 (3^{-1})^{n-1}$ $T_n = 3^5 3^{-n+1}$ $\therefore T_n = 3^{6-n}$	✓ r ✓ substitution into the correct formula /vervang in korrekte formule ✓ $3^5 3^{-n+1}$ Answer given	(3)
	2.1.4	$S_\infty = \frac{a}{1-r}$ $S_\infty = \frac{243}{1-\frac{1}{3}}$ $S_\infty = \frac{729}{2} = 364,5$	✓ substitution into the correct formula / vervang in korrekte formule A ✓ answer/antwoord A	(2)
2.2	2.2.1	$d = 4$	✓ answer/antwoord	(1)
	2.2.2	$T_n = a + (n-1)d$ $124 = -4 + (n-1)(4)$ $124 = -4 + 4n - 4$ $132 = 4n$ $33 = n$ $T_{33} = 124$	✓ $a = -4$ ✓ $T_n = 124$ ✓ substitution into the correct formula / vervang in korrekte formule CA d –value from/waarde van 2.2.1 ✓ answer /antwoord	(4)
2.3	2.3.1	$S_4 = \frac{5(1-3^4)}{-2}$ $= 200$	✓ subst/vervang ✓ answer/antwoord	(2)
	2.3.2	$T_5 = S_5 - S_4$ $T_5 = \frac{5(1-3^5)}{-2} - 200$ $T_5 = 605 - 200$ $T_5 = 405$	✓ $T_5 = S_5 - S_4$ ✓ answer/antwoord	(2)

[17]

QUESTION 3 / VRAAG 3

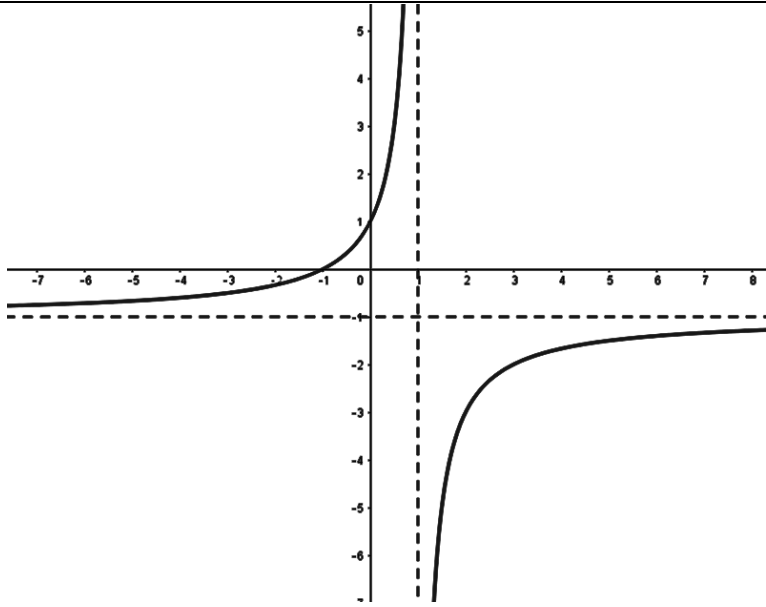
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QUESTION 4 / VRAAG 4

4.1	B(6; 0) AB = 8 units	✓ B ✓ answer/antwoord	(2)
4.2	$g(x) = x - 6$ $g(2) = 2 - 6 = -4$ $D(2; -4)$	✓ x value of/waarde van D ✓ y value of/waarde van D	(2)
4.3	$f(x) = a(x + 2)(x - 6)$ $= a(x^2 - 4x - 12)$ $= ax^2 - 4ax - 12a$ $4a - 8a - 12a = -4$ $-16a = -4$ $a = \frac{4}{16} = \frac{1}{4}$ $\therefore f(x) = \frac{1}{4}x^2 - x - 3$ OR Substitute TP and A: $f(x) = a(x - 2)^2 - 4$ $0 = a(-2 - 2)^2 - 4$ $0 = a(-4)^2 - 4$ $0 = 16a - 4$ $16a = 4$ $a = \frac{4}{16} = \frac{1}{4}$ $f(x) = a(x^2 - 4x + 4) - 4$ $= ax^2 - 4ax + 4a - 4$ $= \frac{1}{4}x^2 - x + 1 - 4$ $= \frac{1}{4}x^2 - x - 3$ Substitute TP and B: $f(x) = a(x - 2)^2 - 4$ $0 = a(6 - 2)^2 - 4$ $0 = a(4)^2 - 4$ $0 = 16a - 4$ $16a = 4$ $a = \frac{4}{16} = \frac{1}{4}$ $f(x) = a(x^2 - 4x + 4) - 4$ $= ax^2 - 4ax + 4a - 4$ $= \frac{1}{4}x^2 - x + 1 - 4$ $= \frac{1}{4}x^2 - x - 3$	✓ Substitute into correct formula/ vervang in korrekte formule ✓ simplify/vereenvoudig ✓ Subst/vervang (2;-4) ✓ value of /waarde van a OR ✓ Substitute into correct formula/ vervang in korrekte formule ✓ simplify/vereenvoudig ✓ value of /waarde van a ✓ Subst/vervang a into simplified f	(4)
4.4	$C(0; -3)$ $k = -3$	✓ value of/waarde van k	(1)
4.5	$m_g = 1$ Tangent: $y = x + c$ $-3 = 4 + c$ $c = -7$ $y = x - 7$	✓ m ✓ c	(2)
4.6	$2 < x < 6$ for $x \in \mathbb{R}$	✓✓ answer/antwoord	(2)
4.7	$(0; -3)$	✓✓ answer/antwoord	(2)

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QUESTION 5 / VRAAG 5

5.1	$x = 1$ $y = -1$	✓✓ Each equation/ <i>elke vergelyking</i>	(2)
5.2	y-intercept : $y = -1$ x - intercept: $0 = \frac{-2}{x-1} - 1$ $x = -1$	✓y-intercept/ <i>afsnit</i> ✓ $y = 0$ ✓x-intercept/ <i>afsnit</i>	(3)
5.3		✓asymptotes/ <i>asimptote</i> ✓intercepts/ <i>afsnitte</i> ✓shape in correct quadrants/ <i>vorm in korrekte kwadrante</i>	(3)
5.4	$-1 = (-1)(1) + c$ $c = 0$ $y = -x$	✓gradient ✓ $c=0$	(2) [10]

QUESTION 6 / VRAAG 6

6.1	$\log_a 4 = -2$ $a^{-2} = 4$ $\therefore a = (2^2)^{-\frac{1}{2}}$ $a = 2^{-1} = \frac{1}{2}$	✓Subst / <i>vervang</i> ✓simplification/ <i>vereenvoudig</i>	(2)
6.2	$f(x) = \log_{\frac{1}{2}} x$ $x = \log_{\frac{1}{2}} y$ $y = \left(\frac{1}{2}\right)^x$	✓swop/ <i>ruil x and/en y</i> ✓Answer/ <i>antwoord</i> AO full marks	(2)
6.3	$h(x) = -\log_{\frac{1}{2}} x$ OR $h(x) = \log_{\frac{1}{2}} x^{-1}$ OR $h(x) = \log_2 x$	✓✓ answer/ <i>antwoord</i>	(2)
6.4	$-4 < x \leq -3$	✓✓ answer/ <i>antwoord</i> AO full marks	(2) [8]

QUESTION 7 / VRAAG 7

7.1	$A = P(1 + i)^n$ $66\,611 = 45\,000 \left(1 + \frac{r}{2}\right)^{10}$ $\left(1 + \frac{r}{2}\right)^{10} = \frac{66\,611}{45\,000}$ $1 + \frac{r}{2} = 1,040$ $\frac{r}{2} = 0,040$ $r = 0,080$ <i>Interest = 8%</i>	✓ answer/antwoord ✓ subst into correct formula/vervang in korekte formule ✓ Simplification/vereenvoudig ✓ value of interest/waarde van rente	(4)
7.2	$F_v = \frac{x[(1 + i)^n - 1]}{i}$ $= \frac{2500 \left[\left(1 + \frac{0,06}{4}\right)^{21} - 1 \right]}{\frac{0,06}{4}}$ $= R\,61\,176,31$	✓ $n = 21$ ✓ $i = \frac{0,06}{4}$ ✓ R2500 substitution into correct formula/vervang in korrekte formule ✓ answer/antwoord CA	(4)
7.3	7.3.1 $A = P(1 + i)^n$ $= 82\,000 \left(1 + \frac{0,15}{12}\right)^5$ $= R87\,254,74$	✓ $n = 5$ ✓ substitution into correct formula/ vervang in korrekte formule ✓ answer/antwoord	(3)
	7.3.2 $P_v = \frac{x[1 - (1 + i)^{-n}]}{i}$ $87\,254,74 = \frac{3200 \left[1 - \left(1 + \frac{0,15}{12}\right)^{-n} \right]}{\frac{0,15}{12}}$ $\frac{87\,254,74 \left(\frac{0,15}{12}\right)}{3\,200} = 1 - \left(1 + \frac{0,15}{12}\right)^{-n}$ $\left(1 + \frac{0,15}{12}\right)^{-n} = 0,6591611719$ $-n = \log_{\left(1 + \frac{0,15}{12}\right)} 0,6591611719$ $n = 33,55$ <i>= 33 installments/paaieimente</i>	✓ substitution into correct formula/ vervang in korrekte formule ✓ $P_v = 87254,74$ CA from 7.3.1 If/As PV = 82000 max 2/4 ✓ correct use of logs/ korrekte gebruik van logs ✓ answer/antwoord	(4) [15]

QUESTION 8 / VRAAG 8**Penalise for notation: Only once (-1) in this question.**

8.1	$f(x) = 4x^2 - x$ $f(x+h) = 4(x+h)^2 - (x+h)$ $= 4(x^2 + 2xh + h^2) - x - h$ $= 4x^2 + 8xh + 4h^2 - x - h$ $f(x+h) - f(x) = 8xh + 4h^2 - h$ $f'(x) = \lim_{h \rightarrow 0} \frac{h(8x + 4h - 1)}{h}$ $= \lim_{h \rightarrow 0} (8x + 4h - 1)$ $= 8x - 1$	✓ $4x^2 + 8xh + 4h^2 - x - h$ ✓ $8xh + 4h^2 - h$ ✓ factorising/faktorisering ✓ simplify/vereenvoudig ✓ answer /antwoord CA	(5)
8.2	8.2.1 $D_x \left[x^2 - \frac{1}{2x^3} + \sqrt{x} \right]$ $= D_x \left[x^2 - \frac{1}{2} x^{-3} + x^{\frac{1}{2}} \right]$ $= 2x + \frac{3}{2} x^{-4} + \frac{1}{2} x^{-\frac{1}{2}}$	✓ $x^{\frac{1}{2}}$ ✓ $2x$ ✓ $\frac{3}{2} x^{-4}$ only CA if index is negative integer/ negatiewe integer ✓ $\frac{1}{2} x^{-\frac{1}{2}}$ only CA if index is rational/ rasionaal	(4)
	8.2.2 $y = k^2 - 4kp + 4p^2$ $\frac{dy}{dk} = 2k - 4p$	✓ standard form/standaard vorm ✓ $2k$ ✓ $-4p$	(3)
8.3	$f'(x) = -2x$ $f'(2) = -4$ $g(x) = px^{-1} - 3$ $g'(x) = -px^{-2}$ $\text{but } g'(2) = -4$ $-p(2)^{-2} = -4$ $-\frac{p}{4} = -4$ $\therefore p = 16$	✓ -4 ✓ $-px^{-2}$ ✓ Equation/vergelyking CA ✓ answer/antwoord	(4) [16]

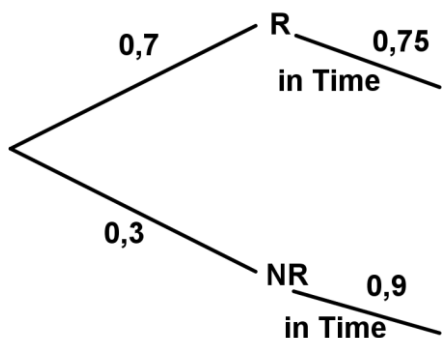
QUESTION 9 / VRAAG 9

9.1	$f(x) = (x + 5)(2x^2 - 13x - 7)$ $0 = (x + 5)(2x + 1)(x - 7)$ $x = -5 ; x = -\frac{1}{2} ; x = 7$ $B = \left(-\frac{1}{2} ; 0\right)$ $C = (7 ; 0)$	$\checkmark (x + 5)$ $\checkmark (2x + 1)(x - 7)$ CA $\checkmark \checkmark$ correct coordinates/korrekte koördinate CA	(4)
9.2.	$f'(x) = 6x^2 - 6x - 72$ $x^2 - x - 12 = 0$ $(x + 3)(x - 4) = 0$ $x = -3$ or $x = 4$ $f(-3) = 2(-3)^3 - 3(-3)^2 - 72(-3) - 35$ $= 100$ or $f(4) = 2(4)^3 - 3(4)^2 - 72(4) - 35$ $= -243$ $D = (-3 ; 100)$ $E = (4 ; -243)$	$\checkmark f'(x)$ $\checkmark = 0$ $\checkmark$ factors/faktore $\checkmark$ both /beide x -values /waardes CA $\checkmark$ both /beide y -values /waardes CA	(5)
9.3	$f''(x) = 12x - 6$ $12x - 6 < 0$ $x < \frac{1}{2}$	$\checkmark$ 2 nd derivative/afgeleide $\checkmark f''(x) < 0$ $\checkmark$ answer/antwoord CA	(3)
9.4	$-5 \leq x \leq -3$ or $-\frac{1}{2} \leq x \leq 0$	$\checkmark -5 \leq x \leq -3$ $\checkmark -\frac{1}{2} \leq x \leq 0$	(2) [14]

QUESTION 10 / VRAAG 10

10	$TSA \text{ of box} = 1350 \text{ cm}^2$ $2(x^2) + 4(xh) = 1350$ $2x^2 + 4xh = 1350$ $h = \frac{1350}{4x} - \frac{x}{2}$ or $h = \frac{1350 - 2x^2}{4x}$ $Volume = x^2 \left(\frac{1350}{4x} - \frac{x}{2} \right)$ $V(x) = \frac{675x}{2} - \frac{x^3}{2}$ $\frac{dV}{dx} = \frac{675}{2} - \frac{3}{2}x^2$ $\frac{675}{2} - \frac{3}{2}x^2 = 0$ $-\frac{3}{2}x^2 = -\frac{675}{2}$ $3x^2 = 675$ $x^2 = 225$ $x = 15$	$\checkmark 2(x^2) + 4(xh)$ $\checkmark h$ $\checkmark$ subst h into <u>correct</u> formula/ Vervang h in korrekte formule If formula incorrect BD! $\checkmark$ Derivative/afgeleide $\checkmark = 0$ $\checkmark x^2$ $\checkmark$ Value of/waarde van x	(7) [7]
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QUESTION 11 /VRAAG 11

11.1	11.1.1	$P(A \text{ and } B) = P(A) \times P(B)$ $0,28 = (0,42 + 0,28) \times (0,28 + x)$ $0,28 = 0,7(0,28 + x)$ $0,4 = 0,28 + x$ $0,4 - 0,28 = x$ $x = 0,12$	✓ subst. into correct formula/ vervang in korrekte formule ✓ Equation simplified /Vergelyking vereenvoudig ✓ $0,4 - 0,28$ CA Answer given / antwoord gegee	(3)
	11.1.2	$y = 1 - 0,82 = 0,18$	✓ answer/antwoord	(1)
	11.1.3	From sketch: $P(A \text{ or } B) = 0,42 + 0,28 + 0,12$ $= 0,82$ OR $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ $P(A \text{ or } B) = 0,7 + 0,4 - 0,28$ $= 0,82$	✓ add values from diagram/ tel waardes op vanaf diagram ✓ answer/antwoord ✓ subst. into correct formula/ vervang in korrekte formule ✓ answer/antwoord	(2)
11.2	 $P(\text{in time}) = (0,7 \times 0,75) + (0,3 \times 0,9)$ $= 0,795 = 79,5\%$		✓✓ method/metode ✓ subst. into correct formula/ vervang in korrekte formule ✓ answer/antwoord	(4) [10]

QUESTION 12 /VRAAG 12

12.1	$6! = 720$	✓ $6!$ or 720	(1)
12.2	$1 \times 4! \times 2 = 48$	✓ $4! \times 2$ ✓	(2)
12.3	$P(\text{start with T, end with vowel}) = \frac{48}{720} \text{ or } \frac{1}{15} \text{ or } 0,07$ $P(\text{NOT}) = 1 - \frac{48}{720} \text{ or } 1 - \frac{1}{15} \text{ or } 1 - 0,07$ $= \frac{672}{720} \text{ or } \frac{14}{15} \text{ or } 0,93$	✓ $\frac{48}{720} \text{ or } \frac{1}{15} \text{ or } 0,27$ CA ✓ Answer/antwoord CA	(2) [5]

TOTAL = 150