

Memo

- 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 1/VRAAG 1

1.1.1	$(x - 2)(3x - 1) = 0$ $x - 2 = 0 \text{ or/of } 3x - 1 = 0$ $x = 2 \text{ or/of } x = \frac{1}{3}$	✓✓ <i>x-values / waardes</i> (2)
1.1.2	$2x^2 + 3x - 7 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(3) \pm \sqrt{(3)^2 - 4(2)(-7)}}{2(2)}$ $x = \frac{-3 \pm \sqrt{65}}{4}$ $\therefore x = 1,27 \text{ or/of } x = -2,77$	Penalise 1 mark for incorrect rounding off./ <i>Penaliseer 1 punt vir verkeerde afronding.</i> ✓ <i>substitution / vervanging</i> ✓✓ <i>x-values / waardes</i> (3)
1.1.3	$-x^2 - 2x + 15 < 0$ $x^2 + 2x - 15 > 0$ $(x + 5)(x - 3) > 0$ $\therefore x < -5 \text{ or/of } x > 3$	✓ <i>factors / faktore</i> ✓ critical values with method/ <i>kritieke waardes met metode</i> ✓✓ <i>answer (accuracy) /</i> <i>antwoord (akkuraatheid)</i> (4)

1.3	<p><i>For equal roots / Vir gelyke wortels :</i></p> $n^2 + 4mn = 0$ $n(n + 4m) = 0$ $\therefore n = 0 \text{ or / of } n = -4m$ $n = 0 \Rightarrow x = \frac{0 \pm \sqrt{(0)^2 - 4m(0)}}{2m}$ $x = 0$ $n = -4m \Rightarrow x = \frac{(-4m) \pm \sqrt{(-4m)^2 + 4m(-4m)}}{2m}$ $x = -2$	<ul style="list-style-type: none"> ✓ $\Delta = 0$ ✓ both n-values / beide n-waardes ✓ substitution / vervanging ✓ $x = 0$ ✓ $x = -2$ <p style="text-align: right;">(5)</p>
		[25]

QUESTION 2/VRAAG 2

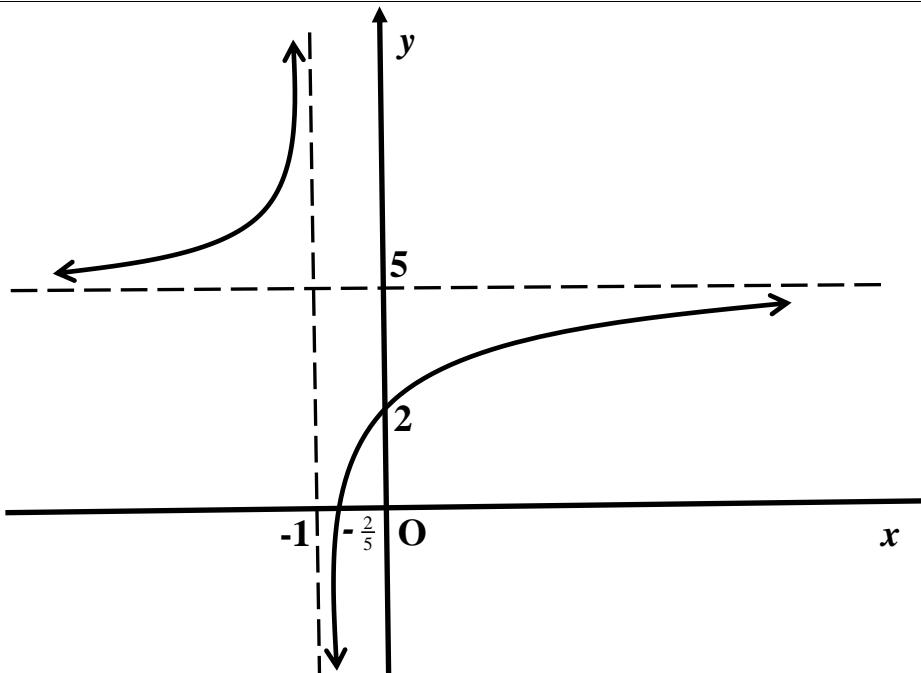
2.1.1	$\begin{array}{rcl} 15 & ; & 10 & ; & 7 & ; & x & ; & 7 \\ -5 & & -3 & & (x-7) & (7-x) & & & - \text{ 1}^{\text{st}} \text{ differences}/\text{1}^{\text{ste}} \text{ verskille} \\ & & 2 & & (x-4) & (-2x+14) & & & - \text{ 2}^{\text{nd}} \text{ differences}/\text{2}^{\text{de}} \text{ verskille} \end{array}$ $\begin{array}{lll} x-4=2 & \text{or / of} & -2x+14=x-4 \\ x=6 & \text{or / of} & -3x=-18 \\ & & x=6 \end{array}$	✓ 2 nd differences / 2 ^{de} verskille ✓ equating / gelyk stel ✓ answer / antwoord (3)
2.1.2	$\begin{array}{lll} 2a = 2 & 3a + b = -5 & a + b + c = 1 \\ a = 1 & 3(1) + b = -5 & 1 - 8 + c = 15 \\ & b = -8 & c = 22 \end{array}$ $\therefore T_n = n^2 - 8n + 22$	✓ $a = 1$ ✓ $b = -8$ ✓ $c = 22$ ✓ answer / antwoord (4)
2.1.3	$\begin{aligned} T_{50} &= (50)^2 - 8(50) + 22 \\ &= 2122 \end{aligned}$	✓ substitution / vervanging ✓ answer / antwoord (2)
2.2.1	$\begin{array}{l} a + 14d = 74 \\ a + 6d = 34 \\ \therefore 8d = 40 \\ d = 5 \end{array}$	✓ setting up 2 equations / opstel van 2 vergelykings ✓ method / metode ✓ answer / antwoord (3)
2.2.2	$\begin{array}{l} a + 6(5) = 34 \\ a = 4 \\ \\ S_{40} = \frac{40}{2} [2(4) + (40-1)(5)] \\ = 4060 \end{array}$	✓ value of a / waarde van a ✓ substitution into correct formula / vervanging in korrekte formule ✓ answer / antwoord (3)
2.2.3	$\sum_{n=1}^{40} (5n-1)$	✓✓ answer / antwoord (accuracy as one unit) (2)

2.3.1	$T_k = \frac{3^k}{15}$ $= \frac{3^k}{5 \times 3}$ $= \frac{1}{5} \times 3^{k-1}$	✓ factors of 15 / faktore van 15 ✓ answer / antwoord (2)
2.3.2	$S_n = \frac{a(r^n - 1)}{r - 1}$ $24 \frac{1}{5} = \frac{\frac{1}{5}(3^n - 1)}{3 - 1}$ $48 \frac{2}{5} = \frac{1}{5}(3^n - 1)$ $242 = 3^n - 1$ $243 = 3^n$ $3^5 = 3^n$ $\therefore n = 5$	✓ a and/en r ✓ substitution into correct formula / vervanging in korrekte formule ✓ exponential equation / eksponensiële vergelyking ✓ answer / antwoord (4)
2.3.3	NO / NEE. $r = 3 > 1$ r not in the interval $-1 < r < 1, r \neq 0$ (nie in die interval)	✓ NO / NEE ✓ reason / rede (2)
2.4	$P = 9^{\frac{1}{3}} \times 9^{\frac{1}{9}} \times 9^{\frac{1}{27}} \times \dots \text{to infinity} / \text{tot oneindigend}$ $= 9^{\frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \dots \text{to infinity}} / \text{tot oneindigend}$ $S_{\infty} = \frac{a}{1 - r}$ $= \frac{\frac{1}{3}}{1 - \frac{1}{3}}$ $= \frac{1}{2}$ $\therefore P = 9^{\frac{1}{2}}$ $= \sqrt{9}$ $= 3$	✓ adding exponents / optel van eksponente ✓ sum to infinity / Som tot oneindiging ✓ answer / antwoord ✓ $P = 9^{\frac{1}{2}} / \sqrt{9}$ (4) [29]

QUESTION 3/VRAAG 3

3.1.1	$P(2;4)$ $Q(0;1)$	✓ coordinates of P / koördinate van P ✓ coordinates of Q / koördinate van Q (2)
3.1.2	$y = a(x-2)^2 + 4$ $1 = a(0-2)^2 + 4$ $-3 = 4a$ $\therefore a = -\frac{3}{4}$ $y = b^x$ $4 = b^2$ $\therefore b = 2$	✓ substitution / vervanging ✓ answer / antwoord ✓ substitution / vervanging ✓ answer / antwoord (4)
3.1.3	$x \geq 2$ / $x \leq 2$	✓✓ answer / antwoord (2)
3.1.4	$h(x) = 2^{f(x)}$ is a maximum when $f(x)$ is a maximum (is 'n maksimum wanneer $f(x)$ 'n maksimum is) max value of $f(x) = 4$ / maks. waarde van $f(x) = 4$ \therefore max of $h(x) = 2^4 = 16$ / maks van $h(x) = 2^4 = 16$	✓ max. value of $f(x)$ / maks. waarde van $f(x)$ ✓ answer / antwoord (2)
3.2.1	$y \geq 1, y \in R$	✓ answer / antwoord (1)
3.2.2	$p(x) = x^2 + 1$ / $r(x) = x^2 + 2x$ $p(x+1) - 2 = (x+1)^2 + 1 - 2$ $= x^2 + 2x + 1 + 1 - 2$ $= x^2 + 2x$ <i>Shift 1 unit to the left and 2 units down</i> <i>Skuif 1 eenheid na links en 2 eenhede af</i> OR/OF Turning Point of $p(x)$ / Draaipunt van $p(x) = (0 ; 1)$ Turning Point of $r(x)$ / Draaipunt van $r(x) = (-1 ; -1)$ \therefore Shift 1 unit to the left and 2 units down / <i>Skuif 1 eenheid na links en 2 eenhede af</i>	✓ calculation / berekening ✓ 1 unit to the left / 1 eenheid na links ✓ 2 units down / 2 eenhede af (3)
		[14]

QUESTION 4/VRAAG 4

4.1	$y = \frac{-3}{0+1} + 5$ $= 2$	✓ y-intercept / y-afsnit (1)
4.2	$\frac{-3}{x+1} + 5 = 0$ $\frac{-3}{x+1} = -5$ $-3 = -5(x+1)$ $-3 = -5x - 5$ $2 = -5x$ $x = -\frac{2}{5}$	✓ simplification / vereenvoudiging ✓ answer / antwoord (2)
4.3		✓ asymptotes / asimptote ✓ x- and y-intercepts x- en y-afsnitte ✓ shape / vorm (3)
4.4	$f(x) = \frac{-3}{x+1} + 5$ $f(x-3) = \frac{-3}{(x-3)+1} + 5$ $= \frac{-3}{x-2} + 5$ $f(x) = \frac{3}{x-2} - 5$	✓ substitution / vervanging ✓ simplification / vereenvoudiging ✓ reflection / refleksie (3)

QUESTION 5/VRAAG 5

5.1	$f(x) = \log_3 x$ $x = \log_3 y$ $f^{-1}(x) = 3^x$	✓ interchanging x and y / <i>omruil van x en y</i> ✓ answer / <i>antwoord</i> (2)
5.2	f^{-1} is a reflection of f in the line $y = x$ / f^{-1} is 'n refleksie van f in die lyn $y = x$	✓✓ answer / <i>antwoord</i> (2)
5.3	$y = \log_3 x$ $-2 = \log_3 k$ $\therefore k = 3^{-2}$ $= \frac{1}{9}$	✓ substitution / <i>vervanging</i> ✓ answer / <i>antwoord</i> (2)
5.4	$0 < x < \frac{1}{9}$ OR / OF $\log_3 x < -2$ and / en $x > 0$ $x < \frac{1}{9}$ and / en $x > 0$ $0 < x < \frac{1}{9}$	✓✓ answer / <i>antwoord</i> (2)
5.5	$x \geq 1$	✓✓ answer / <i>antwoord</i> (2) [10]

QUESTION 6/VRAAG 6

6.1	$1 + i_{eff} = \left(1 + \frac{i_{nom}}{n}\right)^n$ $i_{eff} = \left(1 + \frac{23}{1200}\right)^{12} - 1$ $= 0,2558637702$ <p>effective rate / effektiewe koers = 25,59% p.a</p>	✓ formula / formule ✓ substitution / vervanging ✓ answer / antwoord (3)
6.2	$P = \frac{A}{(1+i)^n}$ $= \frac{15768,39}{\left(1 + \frac{4,38}{400}\right)^{40}}$ $= R10200,00$	✓ <i>i</i> and / en <i>n</i> ✓ substitution / vervanging ✓ answer / antwoord (3)
6.3.1	$n = \frac{\log\left[\frac{A}{P}\right]}{\log(1-i)}$ $n = \frac{\log\left[\frac{50710,00}{200000,00}\right]}{\log\left(1 - \frac{24}{100}\right)}$ <p><i>n</i> = 5 years</p>	✓ <i>A</i> and / en <i>P</i> ✓ substitution / vervanging ✓ making <i>n</i> subject of the formula / maak <i>n</i> die onderwerp van die formule ✓ answer / antwoord (4)
6.3.2	$A = P(1+i)^n$ $= 200000\left(1 + \frac{18}{100}\right)^5$ $= R457551,55$	✓ substitution / vervanging ✓ answer / antwoord (2)
6.3.3	Amount / Bedrag = R457 551,55 – R50 710,00 = R406 841,55	✓ answer / antwoord (1)
		[13]

QUESTION 7/VRAAG 7

	7.1 $f(x) = 1 - 3x^2$ $f(x + h) = 1 - 3(x + h)^2$ $= 1 - 3(x^2 + 2xh + h^2)$ $= 1 - 3x^2 - 6xh - 3h^2$	Penalise 1 mark for incorrect notation in the question / <i>Penaliseer 1 punt vir verkeerde notasie in die vraag</i>	
	$f'(x) = \lim_{h \rightarrow 0} \frac{f(x + h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{1 - 3x^2 - 6xh - 3h^2 - (1 - 3x^2)}{h}$ $= \lim_{h \rightarrow 0} \frac{-6xh - 3h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-6x - 3h)}{h}$ $= \lim_{h \rightarrow 0} (-6x - 3h)$ $= -6x$	$\checkmark 1 - 3x^2 - 6xh - 3h^2$ \checkmark substitution / <i>vervanging</i> \checkmark common factor / <i>gemene faktor</i> \checkmark answer / <i>antwoord</i>	(4)
		Answer ONLY: 0 marks / <i>SLEGS antwoord: 0 punte</i>	
7.2	$y = \left(\sqrt{x} - \frac{1}{\sqrt{x}} \right)^2$ $y = x + 2 + \frac{1}{x}$ $y = x + 2 + x^{-1}$	$\checkmark y = x + 2 + x^{-1}$	
	$\frac{dy}{dx} = 1 - x^{-2}$	$\checkmark 1 \quad \checkmark -x^{-2}$	(3)
7.3	$y = 3x^2 - 2x + 1$ $y' = 6x - 2$ $6x - 2 = 4$ $6x = 6$ $x = 1$ $y = 2 \quad (1; 2)$	$\checkmark y' = 6x - 2$ $\checkmark 6x - 2 = 4$ \checkmark <i>x</i> -coordinate / <i>x-koördinaat \checkmark answer / <i>antwoord</i> </i>	(4)
			[11]

QUESTION 8/VRAAG 8

<p>8.1.1</p> $f(x) = a(x+2)(x-\frac{2}{3})(x-3)$ $-16 = a(2+2)(2-\frac{2}{3})(2-3)$ $-16 = -\frac{16}{3}a$ $a = 3$ $f(x) = 3(x+2)\left(x-\frac{2}{3}\right)(x-3)$ $= 3\left(x-\frac{2}{3}\right)\left(x^2 - x - 6\right)$ $= 3\left(x^3 - x^2 - 6x - \frac{2}{3}x^2 + \frac{2}{3}x + 4\right)$ $= 3x^3 - 5x^2 - 16x + 12$	<ul style="list-style-type: none"> ✓ substitution of x-coordinates / vervanging van x-koördinate ✓ substitution of point / vervanging van punt ✓ value of a / waarde van a ✓ substitution / vervanging ✓ removing brackets / verwijder hakies <p>(5)</p>
<p>8.1.2</p> $f(x) = 3x^3 - 5x^2 - 16x + 12$ $f'(x) = 9x^2 - 10x - 16 = 0$ $(9x + 8)(x - 2) = 0$ $9x + 8 = 0 \text{ or/of } x - 2 = 0$ $x = -\frac{8}{9} \text{ or/of } x = 2$ $y = \frac{4900}{243} (20,16)$ $B\left(-\frac{8}{9}; 20,16\right)$	<ul style="list-style-type: none"> ✓ $f'(x) = 0$ ✓ factors / faktore ✓ x-values / waardes ✓ coordinates of P / koördinate van P <p>(4)</p>
<p>8.1.3</p>	<ul style="list-style-type: none"> ✓ x-intercepts / x-afsnitte ✓ y-intercept / y-afsnit ✓ turning pts / draaipunte ✓ shape / vorm <p>(4)</p>

8.2.1	$f(x) = ax^3 + bx^2 + 3x + 3 \text{ and / en } g(x) = f''(x) = 12x + 4$ $f'(x) = 3ax^2 + 2bx + 3$ $f''(x) = 6ax + 2b$ $6a = 12 \quad \text{and / en} \quad 2b = 4$ $a = 2 \quad \text{and / en} \quad b = 2$	$\checkmark a = 2$ $\checkmark b = 2$ (2)
8.2.2	$12x + 4 = 0$ $x = -\frac{1}{3}$ $\therefore x > -\frac{1}{3}$	$\checkmark x = -\frac{1}{3}$ $\checkmark \text{answer / antwoord}$ (2)
8.2.3	$f''(x) < 0 \text{ for } x < -\frac{1}{3}$ (<i>concave down / konkaaf afwaarts</i>) $f''(x) > 0 \text{ for } x > -\frac{1}{3}$ (<i>concave up / konkaaf opwaarts</i>) $x = -\frac{1}{3}$ is the x -coordinate of the point of inflection where the concavity changes. $x = -\frac{1}{3}$ is die x -koordinaat van die infleksiepunt waar die konkawiteit verander.	$\checkmark \text{answer / antwoord}$ $\checkmark \text{answer / antwoord}$ (2)

[19]

QUESTION 9/VRAAG 9

9.1 $EF = a - 2x$ $\frac{DE}{BE} = \tan 60^0$ $DE = x \tan 60^0$ $= \sqrt{3}x$ $Area = l \times b$ $= \sqrt{3}x \times (a - 2x)$ $= \sqrt{3}ax - 2\sqrt{3}x^2$	<input checked="" type="checkbox"/> EF = (a - 2x) <input checked="" type="checkbox"/> tan ratio / tan verhouding <input checked="" type="checkbox"/> answer / antwoord <input checked="" type="checkbox"/> substitution / vervanging (4)
9.2 $A(x) = \sqrt{3}ax - 2\sqrt{3}x^2$ $A'(x) = \sqrt{3}a - 4\sqrt{3}x = 0$ $x = \frac{-\sqrt{3}a}{-4\sqrt{3}}$ $x = \frac{a}{4}$ $Area = \sqrt{3}a\left(\frac{a}{4}\right) - 2\sqrt{3}\left(\frac{a}{4}\right)^2$ $= \frac{\sqrt{3}}{4}a^2 - \frac{\sqrt{3}}{8}a^2$ $= \frac{\sqrt{3}}{8}a^2$	<input checked="" type="checkbox"/> derivative / afgeleide <input checked="" type="checkbox"/> $f'(x) = 0$ <input checked="" type="checkbox"/> answer / antwoord <input checked="" type="checkbox"/> substitution / vervanging <input checked="" type="checkbox"/> answer / antwoord (5)
	[9]

QUESTION 10/VRAAG 10

10.1.1	$P(F \text{ and } S) = \frac{67}{236} / 0,28$	✓ answer / antwoord (1)																				
10.1.2	$P(M) \times P(\text{not } S)$ $= \frac{120}{236} \times \frac{100}{236}$ $= 0,22$ $P(M \cap \text{not } S) = \frac{51}{236}$ $= 0,22$ $\therefore P(M) \times P(\text{not } S) = P(M \cap \text{not } S)$ $\Rightarrow \text{events are independent} /$ $\text{gebeurtenisse is onafhanklik}$	✓ $P(M) \times P(\text{not } S)$ ✓ answer / antwoord ✓ answer / antwoord ✓ conclusion / gevolgtrekking (4)																				
10.2.1	<table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2"></th> <th style="text-align: center;">OUTCOMES UITKOMSTE</th> <th></th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td style="text-align: center;">BB</td> <td>✓ 1st branch / 1^{ste} tak</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">BR</td> <td>✓ 2nd branch / 2^{de} tak</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">RB</td> <td>✓ outcomes / uitkomste</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">RR</td> <td></td> </tr> </tbody> </table>			OUTCOMES UITKOMSTE				BB	✓ 1 st branch / 1 ^{ste} tak			BR	✓ 2 nd branch / 2 ^{de} tak			RB	✓ outcomes / uitkomste			RR		(3)
		OUTCOMES UITKOMSTE																				
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10.2.2	$\left(\frac{x}{x+2} \times \frac{2}{x+2} \right) + \left(\frac{2}{x+2} \times \frac{x}{x+2} \right) = 0,375$ $\left(\frac{2x}{(x+2)^2} \right) + \left(\frac{2x}{(x+2)^2} \right) = \frac{3}{8}$ $\frac{4x}{(x+2)^2} = \frac{3}{8}$ $3x^2 + 12x + 12 = 32x$ $3x^2 - 20x + 12 = 0$ $(3x - 2)(x - 6) = 0$ $\cancel{x = 2} \text{ or } x = 6$	✓ setting up equation / opstel van vergelyking ✓ standard form / standaardvorm ✓ answer / antwoord (3)																				
		[11]																				
		TOTAL/TOTAAL: 150																				