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GRADE 12/GRAAD 12

TECHNICAL MATHEMATICS P1/TEGNIESE WISKUNDE V1

NOVEMBER 2023

MARKING GUIDELINES/NASIENRIGLYNE

FINAL MARKING GUIDELINES/FINALE NASIENRIGLYNE

MARKS/PUNTE: 150

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

**These marking guidelines consist of 23 pages.
Hierdie nasienriglyne bestaan uit 23 bladsye.**

NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent accuracy (CA) applies in all aspects of the marking guidelines where indicated.
- No penalty for rounding (NPR) for ALL questions.
- # Shows questions where a Tolerance Range will be applied:

Q 1.3.1 ; Q 6.1 ; Q 9.2


LET WEL:

- Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.
- Volgehoue akkuraatheid (CA) is deurgaans op alle aspekte van die nasienriglyne van toepassing soos aangedui.
- Geen penalisering vir afronding (NPR) vir ALLE vrae nie.
- # Toon vrae waar Tolerance wydte (Verdraagsaamheids omvang) toegepas word: **V 1.3.1 ; V 6.1 ; V 9.2**

QUESTION/VRAAG 1

1.1.1	$(7 - 3x)(-8 - x) = 0$ $x = \frac{7}{3}$ OR/OF $\approx 2,33$ or/of $x = -8$	$\checkmark \frac{7}{3} \approx 2,33$ A $\checkmark -8$ A (2)
1.1.2	$3x^2 - 4x = \frac{1}{3}$ $3x^2 - 4x - \frac{1}{3} = 0$ OR/OF $9x^2 - 12x - 1 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)\left(-\frac{1}{3}\right)}}{2(3)}$ OR/OF $\frac{-(-12) \pm \sqrt{(-12)^2 - 4(9)(-1)}}{2(9)}$ $= \frac{4 \pm \sqrt{20}}{6}$ OR/OF $= \frac{12 \pm \sqrt{180}}{18}$ $\therefore x \approx 1,41$ or/of $x \approx -0,08$	\checkmark std form/vorm A \checkmark SF CA \checkmark S \checkmark x - value/waarde CA (4)



1.1.3	$-x^2 + 16 > 0$ $(x-4)(x+4) < 0 \quad \text{OR/OF} \quad (-x+4)(x+4) > 0$ $\text{OR/OF} \quad -(x-4)(x+4) > 0 \quad \text{OR/OF} \quad (-x-4)(x-4) > 0$ $\text{OR/OF} \quad x = \frac{-(0) \pm \sqrt{(0)^2 - 4(1)(-16)}}{2(1)}$ <p>Critical values/ <i>kritiese waardes</i>: 4 and/en -4</p> $\therefore -4 < x < 4 \quad \text{OR/OF} \quad x \in (-4;4) \quad \text{OR/OF} \quad x > -4 \text{ and/en } x < 4$ <p>OR/OF</p> 	<p>✓ M A</p> <p>✓ critical values/ <i>kritiese waardes</i> CA</p> <p>✓ correct notation/ <i>korrekte notasie</i> / correct graphical solution/ <i>korrekte</i> <i>grafiese oplossing</i> A</p> <p>AO: Full marks/Volpunte</p> <p style="text-align: right;">(3)</p>
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1.2	$x - y = 1 \text{ and/en } x + 2xy + y^2 = 9$ $x = y + 1$ $(y+1) + 2y(y+1) + y^2 = 9$ $y + 1 + 2y^2 + 2y + y^2 = 9$ $3y^2 + 3y - 8 = 0$ $y = \frac{-3 \pm \sqrt{3^2 - 4(3)(-8)}}{2(3)} = \frac{-3 \pm \sqrt{105}}{6}$ $\therefore y \approx 1,21 \text{ or/of } y \approx -2,21$ $\therefore x \approx 1,21 + 1 = 2,21 \text{ or/of } x \approx -2,21 + 1 = -1,21$ <p style="text-align: center;">OR/OF</p> $y = x - 1$ $x + 2x(x - 1) + (x - 1)^2 = 9$ $x + 2x^2 - 2x + x^2 - 2x + 1 = 9$ $3x^2 - 3x - 8 = 0$ $x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(3)(-8)}}{2(3)} = \frac{3 \pm \sqrt{105}}{6}$ $\therefore x \approx 2,21 \text{ or/of } x \approx -1,21$ $\therefore y \approx 2,21 - 1 = 1,21 \text{ or/of } y \approx -1,21 - 1 = -2,21$	\checkmark subject/ <i>onderwerp</i> A \checkmark subst./ <i>vervang</i> CA \checkmark std form/vorm CA \checkmark SF CA \checkmark both y-values/ <i>beide y-wrdes</i> CA \checkmark both x-values/ <i>beide x-wrdes</i> CA <p style="text-align: center;">OR/OF</p> \checkmark subject/ <i>onderwerp</i> A \checkmark subst../ <i>vervang</i> CA \checkmark std form/vorm CA \checkmark SF CA \checkmark both x-values/ <i>beide x-wrdes</i> CA \checkmark both y-values/ <i>beide y-wrdes</i> CA <p style="text-align: right;">(6)</p>
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<p>1.3.1 #</p>	$f_r = \frac{1}{2\pi \sqrt{LC}}$ $\sqrt{LC} = \frac{1}{2\pi f_r} \quad \text{OR/OF} \quad f_r \times 2\pi \sqrt{LC} = 1$ $LC = \left(\frac{1}{f_r \times 2\pi} \right)^2$ $L = \left(\frac{1}{f_r \times 2\pi} \right)^2 \div C$ <p style="text-align: center;">OR/OF</p> $f_r = \frac{1}{2\pi \sqrt{LC}}$ $(f_r)^2 = \frac{1}{4\pi^2 LC}$ $LC = \frac{1}{4\pi^2 (f_r)^2}$ $L = \frac{1}{4\pi^2 (f_r)^2 C}$ <p style="text-align: center;">OR/OF</p> $f_r = \frac{1}{2\pi \sqrt{LC}}$ $\sqrt{L} = \frac{1}{2\pi f_r \sqrt{C}}$ $(\sqrt{L})^2 = \left(\frac{1}{2\pi f_r \sqrt{C}} \right)^2$ $L = \frac{1}{4\pi^2 (f_r)^2 C}$	<p>✓ \sqrt{LC} the subject/ die onderwerp / Cross Multiplication/ Kruisvermenigvuldiging A</p> <p>✓ squaring both sides/ kwadr beide kante A</p> <p>✓ L subject/ onderwerp CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ squaring both sides/ kwadr beide kante A</p> <p>✓ LC the subject/ die onderwerp CA</p> <p>✓ L the subject/ die onderwerp CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ \sqrt{L} the subject/ die onderwerp A</p> <p>✓ squaring both sides/ kwadr beide kante A</p> <p>✓ L the subject/ die onderwerp CA</p> <p style="text-align: right;">(3)</p>
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1.3.2	$L = \left(\frac{1}{f_r \times 2\pi} \right)^2 \div C \quad \text{OR/OR} \quad L = \left(\frac{1}{f_r \times 2\pi\sqrt{C}} \right)^2$ $= \left(\frac{1}{1,59 \times 2\pi} \right)^2 \div (0,65 \times 10^{-6}) \quad \text{OR/OR} \quad = \left(\frac{1}{1,59 \times 2\pi\sqrt{0,65 \times 10^{-6}}} \right)^2$ $\approx 15414,61 \text{ H}$ <p style="text-align: center;">OR/OR</p> $f_r = \frac{1}{2\pi \sqrt{LC}}$ $1,59 = \frac{1}{2\pi \sqrt{L \times 0,65 \times 10^{-6}}}$ $L \approx 15414,61 \text{ H}$	<p>✓ SF CA</p> <p>✓ S CA</p> <p style="text-align: center;">OR/OR</p> <p>✓ SF A</p> <p>✓ S CA</p> <p style="text-align: right;">(2)</p>
1.4	$24 = 11000_2$	<p>✓ binary/ binêre A</p> <p style="text-align: right;">(1)</p>
1.5	$144 \div 110_2$ $= 144 \div 6 = 24$ <p style="text-align: center;">OR/OR</p> $144 = 10010000_2$ $10010000_2 \div 110_2 = 11000_2 = 24$	<p>✓ 6 A</p> <p>✓ 24 CA</p> <p style="text-align: center;">OR/OR</p> <p>✓ 10010000₂ A</p> <p>✓ 24 CA</p> <p>AO: Full marks/Volpunte</p> <p style="text-align: right;">(2)</p>
		<p style="text-align: right;">[23]</p>



QUESTION/VRAAG 2

2.1.1	$\Delta = b^2 - 4ac$ $= (-4)^2 - 4(1)(q)$ $= (-4)^2 - 4(1)(4)$ $= 0$	<p>✓ SF A</p> <p>✓ value of discriminant/ waarde van diskriminant CA</p> <p style="text-align: right;">(2)</p>
2.1.2	Equal , real and rational / <i>Gelyk, reëel en rasionaal</i>	<p>✓ Equal , real and rational/ <i>Gelyk, reëel en rasionaal</i></p> <p style="text-align: right;">CA</p> <p style="text-align: right;">(1)</p>
2.2	$x^2 - 4x + p = 0$ $\Delta = b^2 - 4ac$ $= (-4)^2 - 4(1)(p)$ $= 16 - 4p$ $\Delta < 0$ $16 - 4p < 0$ $p > 4$	<p>✓ SF A</p> <p>✓ $\Delta < 0$ A</p> <p>✓ value(s) of/ waardes van p CA</p> <p>AO: Full marks/Volpunte</p> <p style="text-align: right;">(3)</p>
		[6]



QUESTION/VRAAG 3

3.1.1	$\log_a a^{\frac{1}{2}} = \frac{1}{2}(1) = \frac{1}{2}$	$\checkmark \frac{1}{2}$ A (1)
3.1.2	$\sqrt{5x} (\sqrt{45x} + 2\sqrt{80x})$ $= \sqrt{5x} (\sqrt{5 \times 9x} + 2\sqrt{5 \times 16x}) \text{ OR/OF } \sqrt{5x} (3\sqrt{5x} + 8\sqrt{5x})$ $= \sqrt{5x} (11\sqrt{5x}) \quad \text{OR/OF} \quad 3 \times 5x + 2 \times 4 \times 5x$ $= 55x$ <p style="text-align: center;">OR/OF</p> $\sqrt{5x} (\sqrt{45x} + 2\sqrt{80x})$ $= \sqrt{225x^2} + 2\sqrt{400x^2}$ $= 15x + 2(20)x$ $= 55x$	\checkmark simplified surd/expanded surd vorm/ vereenv wrtform/ uitgebreide wrtform A \checkmark S CA \checkmark S CA <p style="text-align: center;">OR/OF</p> \checkmark Expansion/Uitbreiding A \checkmark S CA \checkmark S CA AO 1 mark /punt (3)
3.1.3	$\left(\frac{4^{3n-2}}{2^{3n+2} \cdot 8^{n-3}} \right) \times 8$ $= \left(\frac{(2^2)^{3n-2}}{2^{3n+2} \cdot (2^3)^{n-3}} \right) \times 2^3$ $= \left(\frac{2^{6n-4}}{2^{3n+2} \cdot 2^{3n-9}} \right) \times 2^3$ $= 2^{6n-4-3n-2-3n+9+3}$ $= 2^6 \text{ OR/OF } 64$	\checkmark prime bases/ priemgrontal A \checkmark exponential property/ eksp eienskp CA \checkmark S CA



	OR/OF	OR/OF
	$\left(\frac{4^{3n-2}}{2^{3n+2} \cdot 8^{n-3}}\right) \times 8$ $= 4^{3n-2} \cdot 2^{-3n-2} \cdot 8^{-n+3} \times 8$ $= (2^2)^{3n-2} \cdot 2^{-3n-2} \cdot (2^3)^{-n+3} \times (2^3)$ $= 2^{6n-4-3n-2-3n+9+3}$ $= 2^6 \quad \text{OR/OF} \quad 64$	<p>✓ prime bases/ <i>priemgrontal</i> A</p> <p>✓ exponential property/ <i>eksp eienskap</i> CA</p> <p>✓ S CA</p> <p style="text-align: right;">(3)</p>
3.2	$\log(2x-5) + \log 2 = 1$ $\log 2(2x-5) = 1 \quad \text{OR/OF} \quad \log 2(2x-5) = \log 10$ $2(2x-5) = 10^1$ $4x - 10 = 10$ $\therefore x = 5$ <p style="text-align: center;">OR/OF</p> $\log(2x-5) + \log 2 = 1$ $\log(2x-5) = \log 10 - \log 2$ $\log(2x-5) = \log \frac{10}{2}$ $2x - 5 = 5$ $\therefore x = 5$ <p style="text-align: center;">OR/OF</p>	<p>✓ log prop./ <i>eienskap</i> A</p> <p>✓ exponential form/ <i>eksp. vorm</i> CA</p> <p>✓ S CA</p> <p>✓ value of/ <i>waarde van x</i> CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ log 10 A</p> <p>✓ log prop./ <i>eienskap</i> CA</p> <p>✓ S CA</p> <p>✓ value of/ <i>waarde van x</i> CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ log 10 A</p> <p>✓ log prop./ <i>eienskap</i> CA</p> <p>✓ exponential form/ <i>eksp. vorm</i> CA</p>



	$\log(2x - 5) + \log 2 = 1$ $\log(2x - 5) + \log 2 - \log 10 = 0$ $\log\left(\frac{2(2x - 5)}{10}\right) = 0$ $\frac{4x - 10}{10} = 10^0$ $\frac{4x - 10}{10} = 1$ $4x - 10 = 10$ $4x = 20$ $x = 5$ <p style="text-align: center;">OR/OF</p> $\log(2x - 5) + \log 2 = 1$ $\log 2 = \log 10 - \log(2x - 5)$ $\log 2 = \log \frac{10}{(2x - 5)}$ $2(2x - 5) = 10$ $\therefore x = 5$ <p style="text-align: center;">OR/OF</p> $\log(2x - 5) + \log 2 = 1$ $\log(2x - 5) = 1 - \log 2$ $\log(2x - 5) = 0,6989\dots\dots\dots$ $(2x - 5) = 10^{0,6989\dots}$ $2x - 5 = 5$ $\therefore x = 5$	<p>✓ value of/ waarde van x CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ log10 A</p> <p>✓ log prop.../ eienskap CA</p> <p>✓ S CA</p> <p>✓ value of/ waarde van x CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ S A</p> <p>✓ exponential form/ eksp. vorm CA</p> <p>✓ S CA</p> <p>✓ value of/ waarde van x CA</p> <p>AO: Full marks Volpunte</p> <p style="text-align: right;">(4)</p>
3.3.1	1st quadrant/ kwadrant	<p>✓ 1st quadrant/ kwadrant A</p> <p style="text-align: right;">(1)</p>
3.3.2	$r = z = \sqrt{(2)^2 + (2)^2}$ $= \sqrt{8} \quad \mathbf{OR/OF} \quad 2\sqrt{2} \approx 2,83$	<p>✓ Pythagoras A</p> <p>✓ modulus CA</p> <p>AO: Full marks/Volpunte</p> <p style="text-align: right;">(2)</p>



3.3.3	$\tan \theta = \frac{2}{2} = 1$ $\theta = 45^\circ$ ref / verw \angle $z = 2\sqrt{2} \text{ cis } 45^\circ$ OR/OF $2\sqrt{2} \angle 45^\circ$ OR/OF $2\sqrt{2} \cos 45^\circ + 2\sqrt{2} i \sin 45^\circ$	✓ tan ratio/ <i>verhouding</i> A ✓ angle/ <i>hoek</i> CA ✓ any vorm/ <i>enige vorm</i> CA AO: Full marks/Volpunte (3)
3.4	$x - 3yi = 6 + 9i$ $\therefore x = 6$ $-3y = 9$ $\therefore y = -3$	✓ value of/ <i>waarde van x</i> A ✓ value of / <i>waarde van y</i> A (2)
		[19]



QUESTION 4/VRAAG 4

4.1.1	$g(x) = -x - 2$ $0 = -x - 2$ $x = -2$ $A(-2; 0)$	$\checkmark y = 0$ A $\checkmark x = -2$ A AO: Full marks/Volpunte (2)
4.1.2	$g(x) = -x - 2$ Subst./verv. $(k; -3)$ $-3 = -k - 2$ $k = 1$	\checkmark Subst./verv A (1)
4.1.3	$x = 4$	$\checkmark x = 4$ A (1)
4.1.4	$f(x) = a(x+2)(x-4)$ Subst./verv $(5; -7)$ $-7 = a(5+2)(5-4)$ $-7 = a(7)(1)$ $a = -1$ $\therefore f(x) = -1(x+2)(x-4)$ $= -1(x^2 - 2x - 8)$ $= -x^2 + 2x + 8$	$\checkmark f(x) = a(x+2)(x-4)$ CA \checkmark Subst./verv CA $\checkmark a = -1$ CA \checkmark S CA (4)
4.1.5	$f(x) = -x^2 + 2x + 8$ Subst./verv $x=1$ OR/OF $y = \frac{4ac - b^2}{4a}$ $f(1) = -(1)^2 + 2(1) + 8$ $= 9$ Range/ wrde.versam. : $y \in \mathbb{R} ; y \leq 9$ OR/OF $y \in (-\infty; 9]$	\checkmark Subst./verv A $\checkmark y = 9$ CA $\checkmark y \leq 9$ CA AO: Full marks/Volpunte (3)
4.1.6	$-2 \leq x \leq 5$ OR/OF $x \in [-2; 5]$ OR/OF $x \geq -2$ and/en $x \leq 5$	\checkmark critical values / kritiese waardes CA \checkmark correct notation/ korr notasie A (2)



4.2.1(a)	OD = 4 units/ eenhede	✓ 4	A (1)
4.2.1(b)	$r^2 = 16 = 4^2$ $h(x) = \sqrt{16 - x^2}$ OR/OF $h(x) = \sqrt{4^2 - x^2}$	✓ 16 ✓ $\sqrt{16 - x^2}$ OR/OF $\sqrt{4^2 - x^2}$	CA CA AO: Full marks/Volpunte (2)
4.2.2	$p(x) = a^x - 4$ Subst./verv (-4 ; 12) $12 = a^{-4} - 4$ $16 = a^{-4}$ $a = \frac{1}{2}$	✓ Subst./verv ✓ S ✓ $\frac{1}{2}$	A CA CA (3)
4.2.3	$p(x) = \left(\frac{1}{2}\right)^x - 4$ $= \left(\frac{1}{2}\right)^0 - 4$ OR/OF $= a^0 - 4$ $= 1 - 4 = -3$	✓ Subst./verv $x = 0$ ✓ S AO Full marks Volpunte	A CA (2)
4.2.4	$\therefore f(x) = p(x) + 3$ $f(x) = a^x - 4 + 3$ OR/OF $y = -4 + 3$ $= a^x - 1$ $\therefore y = -1$	✓ $t = 3$ ✓ $y = -1$ AO Full marks Volpunte	A CA (2)
4.3		<p>g:</p> <ul style="list-style-type: none"> ✓ horizontal asymptote / horisontale asimptoot A ✓ shape / vorm A ✓ x- intercept / afsnit A 	(3)



QUESTION/VRAAG 5

5.1	$i_{eff} = \left(1 + \frac{i}{m}\right)^m - 1$ $= \left(1 + \frac{0,08}{12}\right)^{12} - 1$ $\approx 0,08299 \approx 8,30\%$	<p>✓ F A</p> <p>✓ SF A</p> <p>✓ $i_{eff} \approx 8,30\%$ CA</p> <p>AO Full marks/ Volpunte</p> <p>(3)</p>
5.2	$A = P(1 + i)^n$ $= R\ 25\ 000 \left(1 + \frac{0,096}{4}\right)^{4 \times 7}$ $\approx R\ 48\ 566,72$ <p style="text-align: center;">OR/OF</p> $i_{eff} = \left(1 + \frac{0,096}{4}\right)^4 - 1 \approx 0,09951.....$ $A = P(1 + i)^n$ $= R\ 25\ 000 (1 + 0,09951.....)^7$ $\approx R\ 48\ 566,72$	<p>✓ F A</p> <p>✓ $n = 4 \times 7$ OR/OF 28 A</p> <p>✓ SF A</p> <p>✓ S CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ $i_{eff} \approx 0,09951.....$ A</p> <p>✓ F A</p> <p>✓ SF A</p> <p>✓ S CA</p> <p>AO Full marks /Volpunte</p> <p>(4)</p>
5.3.1	$A = P(1 - i)^n$ $50 = 80(1 - i)^2$ $\frac{5}{8} = (1 - i)^2$ $\sqrt{\frac{5}{8}} = 1 - i$ $i = 0,209...$ $r \approx 20,94\%$ $r \approx 21$	<p>✓ F A</p> <p>✓ SF A</p> <p>✓ make i the subject/ maak i die onderworp CA</p> <p>✓ decimal value of i/ desimale waarde van i CA</p> <p>(4)</p>
5.3.2	$A = P(1 - i)^n$ $80 = P \left(1 - \frac{21}{100}\right)^6$ $P \approx 329,10\ ^\circ\text{C}$ <p style="text-align: center;">OR/OF</p> $50 = P \left(1 - \frac{21}{100}\right)^8$ $P \approx 329,57\ ^\circ\text{C}$	<p>✓ F A</p> <p>✓ SF A</p> <p>✓ S CA</p> <p>(3)</p>
		[14]



QUESTION/VRAAG 6

6.1 #	$f(x) = x - 5$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{(x+h) - 5 - (x-5)}{h}$ $= \lim_{h \rightarrow 0} \frac{x+h-5-x+5}{h}$ $= \lim_{h \rightarrow 0} \frac{h}{h}$ $= \lim_{h \rightarrow 0} (1)$ $\therefore f'(x) = 1$	<p>✓ definition/definisie A</p> <p>✓ SF A</p> <p>✓ S CA</p> <p>✓ S CA</p> <p>✓ 1 CA</p> <p>Penalty: 1 mark for incorrect notation/ Penaliseer : 1 punt vir foutive notasie</p> <p>AO : 1 mark/ punt</p> <p>(5)</p>
6.2.1	$D_x[-3x^9 - 7x]$ $= -27x^8 - 7$	<p>✓ $-27x^8$ A</p> <p>✓ -7 A</p> <p>(2)</p>
6.2.2	$f(x) = \frac{3}{2x} + \sqrt[5]{x^{-2}}$ $= \frac{3}{2}x^{-1} + x^{-\frac{2}{5}}$ $f'(x) = -\frac{3}{2}x^{-2} - \frac{2}{5}x^{-\frac{7}{5}}$	<p>✓ $\frac{3}{2}x^{-1}$ A</p> <p>✓ $x^{-\frac{2}{5}}$ A</p> <p>✓ $-\frac{3}{2}x^{-2}$ CA</p> <p>✓ $-\frac{2}{5}x^{-\frac{7}{5}}$ CA</p> <p>(4)</p>
6.2.3	$y^3 t^2 = 64t^{11}$ $y^3 = 64t^9$ $y = \sqrt[3]{64t^9}$ $= 4t^3$ $\frac{dy}{dt} = 12t^2$	<p>✓ $y^3 = 64t^9$ A</p> <p>✓ $4t^3$ CA</p> <p>✓ $12t^2$ CA</p> <p>(3)</p>



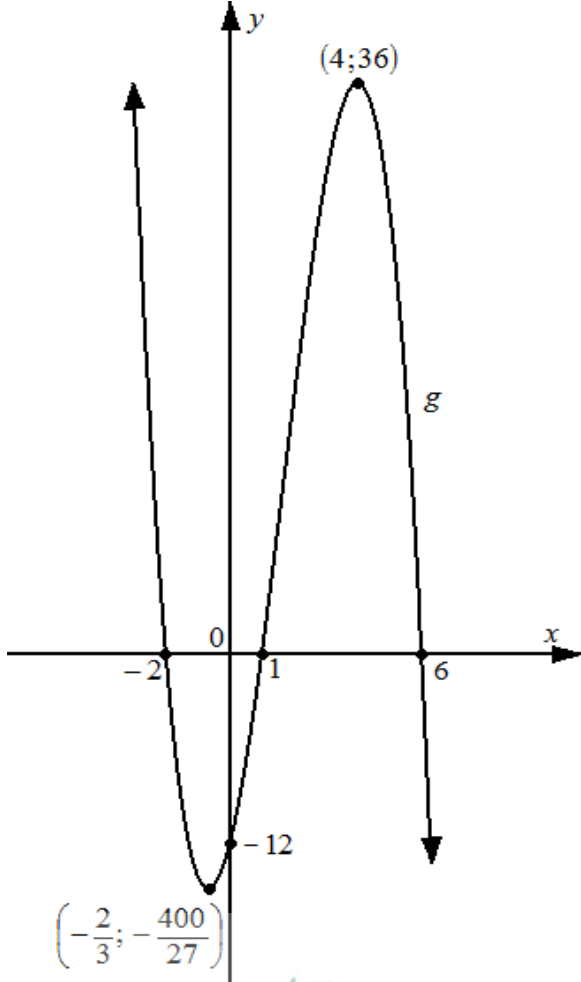
6.3.1	$\therefore h(1) = -2(1)^2 + (1) - 5 = -6$	✓ -6	A (1)
6.3.2	$\text{Av/ Ge. gradient} = \frac{h(x_2) - h(x_1)}{x_2 - x_1} \quad \text{OR/OR} \quad \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{-26 - (-6)}{-3 - 1}$ $= 5$	✓ F ✓ SF ✓ 5	A CA CA (3)
6.4	$f(x) = x^3 + 2$ $f'(x) = 3x^2$ $m_t = f'(4) = 3(4)^2 = 48$ and $p(4) = (4)^3 + 2 = 66$ $\therefore y = mx + c \quad \text{OR/OR} \quad y - y_1 = m(x - x_1)$ $66 = (48)(4) + c \quad y - (66) = 48(x - 4)$ $c = -126 \quad y - 66 = 48x - 192$ $\therefore y = 48x - 126$	✓ derivative/ afgeleide ✓ gradient ✓ y-coordinate/ koordinaat ✓ SF ✓ Equation of tangent/ vergelyking van die raaklyn	A CA A CA CA (5)
			[23]



QUESTION/VRAAG 7

7.1	$y = -12$ OR/OF $(0 ; -12)$	$\checkmark y = -12$ OR/OF $(0 ; -12)$ A (1)
7.2	$g(-2) = -(-2)^3 + 5(-2)^2 + 8(-2) - 12$ $= 0$	$\checkmark 0$ A (1)
7.3	$0 = -x^3 + 5x^2 + 8x - 12$ $(x + 2)(-x^2 + 7x - 6) = 0$ $(x + 2)(-x + 1)(x - 6) = 0$ $\therefore x = -2$ or/of $x = 1$ or/of $x = 6$ OR/OF $0 = x^3 - 5x^2 - 8x + 12$ $(x + 2)(x^2 - 7x + 6) = 0$ $(x + 2)(x - 1)(x - 6) = 0$ $\therefore x = -2$ or/of $x = 1$ or/of $x = 6$ OR/OF $(x - 1)(-x^2 + 4x + 12) = 0$ $(x - 1)(-x + 6)(x + 2) = 0$ $\therefore x = -2$ or/of $x = 1$ or/of $x = 6$ OR/OF $(x - 1)(x^2 - 4x - 12) = 0$ $(x - 1)(x - 6)(x + 2) = 0$ $\therefore x = -2$ or/of $x = 1$ or/of $x = 6$ OR/OF $(x - 6)(-x^2 - x + 2) = 0$ $(x - 6)(-x + 1)(x + 2) = 0$ $\therefore x = -2$ or/of $x = 1$ or/of $x = 6$ OR/OF $(x - 6)(x^2 + x - 2) = 0$ $(x - 6)(x - 1)(x + 2) = 0$ $\therefore x = -2$ or/of $x = 1$ or/of $x = 6$	\checkmark M A $\checkmark\checkmark\checkmark$ x- intercepts/ afsnitte CA OR/OF \checkmark M A $\checkmark\checkmark\checkmark$ x- intercepts/ afsnitte CA OR/OF \checkmark M A $\checkmark\checkmark\checkmark$ x- intercepts/ afsnitte CA OR/OF \checkmark M A $\checkmark\checkmark\checkmark$ x- intercepts/ afsnitte CA OR/OF \checkmark M A $\checkmark\checkmark\checkmark$ x- intercepts/ afsnitte CA OR/OF \checkmark M A $\checkmark\checkmark\checkmark$ x- intercepts/ afsnitte CA AO Full marks /Volpunte



<p>7.4</p>	$g'(x) = -3x^2 + 10x + 8 = 0$ $(3x + 2)(-x + 4) = 0 \text{ OR/OR } x = \frac{-(10) \pm \sqrt{(10)^2 - 4(-3)(8)}}{2(-3)}$ $\therefore x = -\frac{2}{3} \text{ or/of } x = 4$ $g\left(-\frac{2}{3}\right) = -\left(-\frac{2}{3}\right)^3 + 5\left(-\frac{2}{3}\right)^2 + 8\left(-\frac{2}{3}\right) - 12$ $= -\frac{400}{27} \approx -14,81$ $g(4) = -(4)^3 + 5(4)^2 + 8(4) - 12 = 36$ $\therefore \left(-\frac{2}{3}; -\frac{400}{27}\right) \text{ or/of } (4; 36)$ <p style="text-align: center;">OR/OR</p> $\therefore (-0,67; -14,81) \text{ or/of } (4; 36)$	<p>✓ derivative/afgeleide A ✓ equating derivative to 0/ stel afgeleide gelyk aan 0 A ✓ factors/formula/faktore CA</p> <p>✓ both values of /beide waardes van x CA</p> <p>✓ both values of /beide waardes van y CA</p> <p style="text-align: right;">(5)</p>
<p>7.5</p>		<p>✓ y-intercept/ afsnit CA ✓ all x-intercepts/ alle x-afsnitte CA</p> <p>✓ both turning points/ beide draaipunte CA ✓ shape /vorm A</p> <p style="text-align: right;">(4)</p>



7.6	$-2 < x < 1$ or/of $x > 6$	✓ endpoints/ <i>eindpunte</i> ✓ notation/ <i>notasie</i> ✓ $x > 6$	CA A CA
	OR/OF	OR/OF	
	$x \in (-2 ; 1)$ or/of $(6 ; \infty)$	✓ endpoints/ <i>eindpunte</i> ✓ notation/ <i>notasie</i> ✓ $(6 ; \infty)$	CA A CA
	OR/OF	OR/OF	
	$x > -2$ and/en $x < 1$ or/of $x > 6$	✓ endpoints/ <i>eindpunte</i> ✓ notation/ <i>notasie</i> ✓ $x > 6$	CA A CA
			(3)
			[18]



QUESTION/VRAAG 8

8.1	$V = \pi r^2 h$ $350 = \pi r^2 h$ $\therefore h = \frac{350}{\pi r^2}$	✓ SF	A
8.2	$TSA = 2\pi r^2 + 2\pi r h$ $A(r) = 2\pi r^2 + 2\pi r \left(\frac{350}{\pi r^2} \right)$ $= 2\pi r^2 + \frac{700}{r}$	✓ F ✓ SF	A A
8.3	$A(r) = 2\pi r^2 + 700r^{-1}$ $A'(r) = 4\pi r - 700r^{-2}$ $= 4\pi r - \frac{700}{r^2}$ <p>For/ vir minimum: $A'(r) = 0$</p> $4\pi r - \frac{700}{r^2} = 0$ $4\pi r^3 - 700 = 0$ $r^3 = \frac{700}{4\pi}$ $r = \sqrt[3]{\frac{700}{4\pi}} \approx 3,82 \text{ cm}$ $h \approx \frac{350}{\pi(3,82)^2} \approx 7,63 \text{ cm}$	✓ derivative/ afgeleide ✓ equating derivative to/ stel afgeleide gelyk aan 0 ✓ S	A A CA
			NPU (5)
			[8]



QUESTION/VRAAG 9

9.1.1	$\int -4 dt$ $= -4t + C$	$\checkmark -4t$ $\checkmark C$	A A (2)
9.1.2	$\int x^5 (x^3 - 9x^{-6}) dx$ $= \int (x^8 - 9x^{-1}) dx \quad \text{OR/OF} \quad \int \left(x^8 - 9\left(\frac{1}{x}\right) \right) dx$ $= \frac{x^9}{9} - 9 \ln x + C$	$\checkmark S$ $\checkmark \frac{x^9}{9}$ $\checkmark -9 \ln x$	A CA CA (3)
9.2 #	<p>Area bounded by curve and x-axis/ <i>oppervlakte begrens deur kromme en x-as:</i></p> $A = \int_{-1}^3 (-x^2 + 2x + 3) dx$ $= \left[-\frac{x^3}{3} + x^2 + 3x \right]_{-1}^3$ $= \left[-\frac{(3)^3}{3} + (3)^2 + 3(3) \right] - \left[-\frac{(-1)^3}{3} + (-1)^2 + 3(-1) \right]$ $= \frac{32}{3} \quad \text{OR/OF} \quad \approx 10,67 \text{ units}^2 / \text{eenh}^2$ <p>Area/Oppervlak Δ OEC:</p> $= \frac{1}{2} \times 2 \times 3 \quad \text{OR/OF} \quad = \int_0^2 \left(-\frac{3}{2}x + 3 \right) dx$ $= \left[-\frac{3}{4}x^2 + 3x \right]_0^2$ $= 3 \text{ units}^2 / \text{eenh}^2$ <p>Total shaded Area/ Totale gearseerde oppervlakte</p> $= \frac{32}{3} - 3 \text{ units}^2 / \text{eenh}^2$ $= \frac{23}{3} \quad \text{OR/OF} \quad \approx 7,67 \text{ units}^2 / \text{eenh}^2$ <p style="text-align: center;">OR/OF</p>	\checkmark Area notation using integrals/ <i>Area-notasie met gebruik van integrale</i> M A $\checkmark -\frac{x^3}{3} + x^2 + 3x$ A $\checkmark \checkmark$ SF CA $\checkmark \frac{32}{3}$ or / of $10,67 \text{ units}^2 / \text{eenh}^2$ CA \checkmark M A \checkmark Area of/ <i>oppervlakte van</i> Δ A $\checkmark \frac{23}{3} \approx 7,67 \text{ units}^2 / \text{eenh}^2$ CA <p style="text-align: center;">OR/OF</p>	



$A = \int_{-1}^0 (-x^2 + 2x + 3) dx$ $= \left[-\frac{x^3}{3} + x^2 + 3x \right]_{-1}^0$ $= \left[-\frac{(0)^3}{3} + (0)^2 + 3(0) \right] - \left[-\frac{(-1)^3}{3} + (-1)^2 + 3(-1) \right]$ $= \frac{5}{3} \quad \text{OR/OF} \approx 1,67 \text{ units} / \text{eenh}^2$	<p>✓ Area notation using integrals/ Area-notasie met gebruik van integrale M A</p> <p>✓ <math>-\frac{x^3}{3} + x^2 + 3x A</math></p> <p>✓✓ SF CA</p>
$A = \int_0^2 (-x^2 + 2x + 3) dx$ $= \left[-\frac{x^3}{3} + x^2 + 3x \right]_0^2$ $= \left[-\frac{(2)^3}{3} + (2)^2 + 3(2) \right] - \left[-\frac{(0)^3}{3} + (0)^2 + 3(0) \right]$ $= \frac{22}{3} \quad \text{OR/OF} \approx 7,33 \text{ units} / \text{eenh}^2$	
$A = \int_2^3 (-x^2 + 2x + 3) dx$ $= \left[-\frac{x^3}{3} + x^2 + 3x \right]_2^3$ $= \left[-\frac{(3)^3}{3} + (3)^2 + 3(3) \right] - \left[-\frac{(2)^3}{3} + (2)^2 + 3(2) \right]$ $= \frac{5}{3} \quad \text{OR/OF} \approx 1,67 \text{ units} / \text{eenh}^2$	
<p>Area bounded by curve and x- axis/ oppervlakte begrens deur kromme en x-as</p> $= \frac{5}{3} + \frac{22}{3} + \frac{5}{3} = \frac{32}{3} \approx 10,67 \text{ units}^2 / \text{eenh}^2$	<p>✓ $\frac{32}{3}$ or / of $10,67 \text{ units}^2 / \text{eenh}^2$</p>
<p>Area of /opp.vlak. van Δ OEC</p> $= \frac{1}{2} \times 2 \times 3 \quad \text{OR/OF} \quad = \int_0^2 \left(-\frac{3}{2}x + 3 \right) dx$ $= \left[-\frac{3}{4}x^2 + 3x \right]_0^2$ $= 3 \text{ units}^2 / \text{eenh}^2$	<p>✓ M A</p> <p>✓ Area of/ opp. vlak. van Δ A</p>
<p>∴ Total shaded Area/ Totale gearseerde oppervlakte</p> $= \frac{32}{3} - 3 = \frac{23}{3} \quad \text{OR/OF} \approx 7,67 \text{ units}^2 / \text{eenh}^2$	<p>✓ $\frac{23}{3} \approx 7,67 \text{ units}^2 / \text{eenh}^2$ CA</p>



	<p style="text-align: center;">OR/OF</p> $A = \int_{-1}^0 (-x^2 + 2x + 3) dx$ $= \left[-\frac{x^3}{3} + x^2 + 3x \right]_{-1}^0$ $= \left[-\frac{(0)^3}{3} + (0)^2 + 3(0) \right] - \left[-\frac{(-1)^3}{3} + (-1)^2 + 3(-1) \right]$ $= \frac{5}{3} \quad \text{OR/OF} \approx 1,67 \text{ units / eenh}^2$ $A = \int_0^3 (-x^2 + 2x + 3) dx$ $= \left[-\frac{x^3}{3} + x^2 + 3x \right]_0^3$ $= \left[-\frac{(3)^3}{3} + (3)^2 + 3(3) \right] - \left[-\frac{(0)^3}{3} + (0)^2 + 3(0) \right]$ $= 9 \text{ units / eenh}^2$ <p>Area bounded by curve and x- axis/ oppervlakte begrens deur kromme en x-as</p> $= \frac{5}{3} + 9 = \frac{32}{3} \approx 10,67 \text{ units}^2 / \text{eenh}^2$ <p>Area of /opp.vlak. van Δ OEC</p> $= \frac{1}{2} \times 2 \times 3 \quad \text{OR/OF} \quad = \int_0^2 \left(-\frac{3}{2}x + 3 \right) dx$ $= 3 \text{ units}^2 / \text{eenh}^2 \quad = \left[-\frac{3}{4}x^2 + 3x \right]_0^2$ <p>\therefore Total shaded Area/ Totale gearseerde oppervlakte</p> $= \frac{32}{3} - 3 = \frac{23}{3} \quad \text{OR/OF} \approx 7,67 \text{ units}^2 / \text{eenh}^2$	<p style="text-align: center;">OR/OF</p> <p>✓ Area notation using integrals/ Area-notasie met gebruik van integrale M A</p> <p>✓ $-\frac{x^3}{3} + x^2 + 3x$ A</p> <p>✓✓ SF CA</p> <p>✓ $\frac{32}{3}$ or / of $10,67 \text{ units}^2 / \text{eenh}^2$</p> <p>✓M A</p> <p>✓ Area of/ opp. vlak. van Δ A</p> <p>✓ $\frac{23}{3} \approx 7,67 \text{ units}^2 / \text{eenh}^2$ CA</p> <p style="text-align: right;">(8)</p>
		[13]
		[150]