



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE NASIONALE SENIOR SERTIFIKAAT

GRADE 12/GRAAD 12

TECHNICAL MATHEMATICS P1/TEGNIESE WISKUNDE VI

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

<p>1.2</p> <p>$x - y = 1$ and/en $x + 2xy + y^2 = 9$</p> <p>$x = y + 1$</p> <p>$(y+1) + 2y(y+1) + y^2 = 9$</p> <p>$y + 1 + 2y^2 + 2y + y^2 = 9$</p> <p>$3y^2 + 3y - 8 = 0$</p> <p>$y = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(3)(-8)}}{2(3)} = \frac{-3 \pm \sqrt{105}}{6}$</p> <p>$\therefore y \approx 1,21$ or/of $y \approx -2,21$</p> <p>$\therefore x \approx 1,21 + 1 = 2,21$ or/of $x \approx -2,21 + 1 = -1,21$</p> <p style="text-align: center;">OR/OF</p> <p>$y = x - 1$</p> <p>$x + 2x(x - 1) + (x - 1)^2 = 9$</p> <p>$x + 2x^2 - 2x + x^2 - 2x + 1 = 9$</p> <p>$3x^2 - 3x - 8 = 0$</p> <p>$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(3)(-8)}}{2(3)} = \frac{3 \pm \sqrt{105}}{6}$</p> <p>$\therefore x \approx 2,21$ or/of $x \approx -1,21$</p> <p>$\therefore y \approx 2,21 - 1 = 1,21$ or/of $y \approx -1,21 - 1 = -2,21$</p>	<p>✓ subject/ <i>onderwerp</i> A</p> <p>✓ subst./ <i>vervang</i> CA</p> <p>✓ std form/vorm CA</p> <p>✓ SF CA</p> <p>✓ both y-values/<i>beide y-wrdes</i> CA</p> <p>✓ both x-values/<i>beide x-wrdes</i> CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ subject/ <i>onderwerp</i> A</p> <p>✓ subst./ <i>vervang</i> CA</p> <p>✓ std form/vorm CA</p> <p>✓ SF CA</p> <p>✓ both x-values/<i>beide x-wrdes</i> CA</p> <p>✓ both y-values/<i>beide y-wrdes</i> CA</p> <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/ <i>die onderwerp</i> / Cross Multiplication/ <i>Kruisvermenigvuldiging</i> A</p> <p>✓ squaring both sides/ <i>kwadr beide kante</i> A</p> <p>✓ L subject/ <i>onderwerp</i> CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ squaring both sides/ <i>kwadr beide kante</i> A</p> <p>✓ LC the subject/ <i>die onderwerp</i> CA</p> <p>✓ L the subject/ <i>die onderwerp</i> CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ \sqrt{L} the subject/ <i>die onderwerp</i> A</p> <p>✓ squaring both sides/ <i>kwadr beide kante</i> A</p> <p>✓ L the subject/ <i>die onderwerp</i> CA</p> <p style="text-align: right;">(3)</p>
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<p>1.3.2</p>	$L = \left(\frac{1}{f_r \times 2\pi} \right)^2 \div C \quad \text{OR/OF} \quad L = \left(\frac{1}{f_r \times 2\pi\sqrt{C}} \right)^2$ $= \left(\frac{1}{1,59 \times 2\pi} \right)^2 \div (0,65 \times 10^{-6}) \quad \text{OR/OF} \quad = \left(\frac{1}{1,59 \times 2\pi\sqrt{0,65 \times 10^{-6}}} \right)^2$ $\approx 15414,61 \text{ H}$ <p style="text-align: center;">OR/OF</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/OF</p> <p>✓ SF A</p> <p>✓ S CA</p> <p style="text-align: right;">(2)</p>
<p>1.4</p>	$24 = 11000_2$	<p>✓ binary/ binêre A (1)</p>
<p>1.5</p>	$144 \div 110_2$ $= 144 \div 6 = 24$ <p style="text-align: center;">OR/OF</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/OF</p> <p>✓ 10010000₂ A</p> <p>✓ 24 CA</p> <p>AO: Full marks/Volpunte (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 (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	$\log_a a^{\frac{1}{2}} = \frac{1}{2}(1) = \frac{1}{2}$	✓ $\frac{1}{2}$ 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> $\sqrt{5x} (\sqrt{45x} + 2\sqrt{80x})$ $= \sqrt{225x^2} + 2\sqrt{400x^2}$ $= 15x + 2(20)x$ $= 55x$	✓ simplified surd/expanded surd vorm/ vereenv wrtlvorm/ uitgebreide wrtlvorm A ✓ S CA ✓ S CA <p style="text-align: center;">OR/OF</p> ✓ Expansion/Uitbreiding A ✓ S CA ✓ S CA AO 1 mark /punt (3)
3.1.3	$\left(\frac{4^{3n-2}}{2^{3n+2} \cdot 8^{n-3}} \right) \times 8$ $= \left(\frac{(2^2)^{3n-2}}{2^{3n+2} \cdot (2^3)^{n-3}} \right) \times 2^3$ $= \left(\frac{2^{6n-4}}{2^{3n+2} \cdot 2^{3n-9}} \right) \times 2^3$ $= 2^{6n-4-3n-2-3n+9+3}$ $= 2^6 \text{ OR/OF } 64$	✓ prime bases/ priemgrontal A ✓ exponential property/ eksps eienskap CA ✓ S CA

	<p style="text-align: center;">OR/OF</p> $\left(\frac{4^{3n-2}}{2^{3n+2} \cdot 8^{n-3}}\right) \times 8$ $= 4^{3n-2} \cdot 2^{-3n-2} \cdot 8^{-n+3} \times 8$ $= (2^2)^{3n-2} \cdot 2^{-3n-2} \cdot (2^3)^{-n+3} \times (2^3)$ $= 2^{6n-4-3n-2-3n+9+3}$ $= 2^6 \quad \text{OR/OF} \quad 64$	<p style="text-align: center;">OR/OF</p> <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>
<p>3.2</p>	<p>$\log(2x - 5) + \log 2 = 1$ $\log 2(2x - 5) = 1$ OR/OF $\log 2(2x - 5) = \log 10$</p> <p>$2(2x - 5) = 10^1$ $4x - 10 = 10$ $\therefore x = 5$</p> <p style="text-align: center;">OR/OF</p> <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> <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>✓ log10 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>✓ log10 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>✓ log 10 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>
<p>3.3.1</p>	<p>1st quadrant/ kwadrant</p>	<p>✓ 1st quadrant/ kwadrant A</p> <p style="text-align: right;">(1)</p>
<p>3.3.2</p>	$r = z = \sqrt{(2)^2 + (2)^2}$ $= \sqrt{8} \quad \mathbf{OR/OF} \quad 2\sqrt{2} \approx 2,83$	<p>✓ Pythagoras A</p> <p>✓ modulus CA</p> <p>AO: Full marks/Volpunte</p> <p style="text-align: right;">(2)</p>

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

QUESTION 4/VRAAG 4

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

QUESTION/VRAAG 5

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

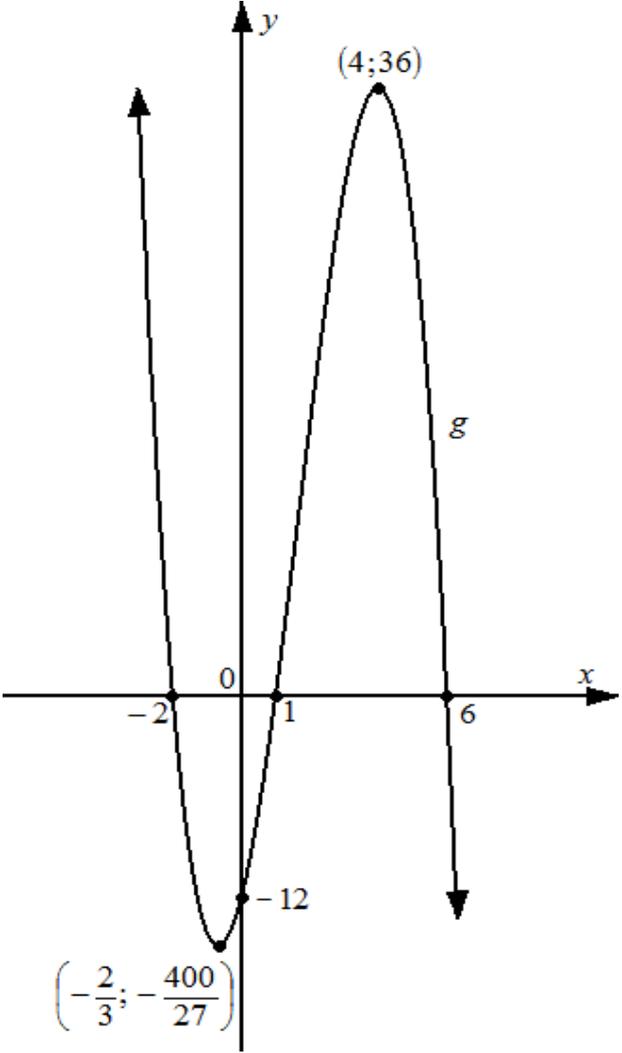
QUESTION/VRAAG 6

<p>6.1 #</p>	$f(x) = x - 5$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{(x+h) - 5 - (x-5)}{h}$ $= \lim_{h \rightarrow 0} \frac{x+h-5-x+5}{h}$ $= \lim_{h \rightarrow 0} \frac{h}{h}$ $= \lim_{h \rightarrow 0} (1)$ $\therefore f'(x) = 1$	<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>
<p>6.2.1</p>	$D_x[-3x^9 - 7x]$ $= -27x^8 - 7$	<p>✓ $-27x^8$ A</p> <p>✓ -7 A</p> <p>(2)</p>
<p>6.2.2</p>	$f(x) = \frac{3}{2x} + \sqrt[5]{x^{-2}}$ $= \frac{3}{2}x^{-1} + x^{-\frac{2}{5}}$ $f'(x) = -\frac{3}{2}x^{-2} - \frac{2}{5}x^{-\frac{7}{5}}$	<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>
<p>6.2.3</p>	$y^3 t^2 = 64t^{11}$ $y^3 = 64t^9$ $y = \sqrt[3]{64t^9}$ $= 4t^3$ $\frac{dy}{dt} = 12t^2$	<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	$f(x) = x^3 + 2$ $f'(x) = 3x^2$ $m_t = f'(4) = 3(4)^2 = 48$ $\text{and } p(4) = (4)^3 + 2 = 66$ $\therefore y = mx + c \quad \text{OR/OR} \quad y - y_1 = m(x - x_1)$ $66 = (48)(4) + c \quad y - (66) = 48(x - 4)$ $c = -126 \quad y - 66 = 48x - 192$ $\therefore y = 48x - 126$	✓ derivative/ <i>afgeleide</i> ✓ gradient ✓ y-coordinate/ <i>koordinaat</i> ✓ SF ✓ Equation of tangent/ <i>vergelyking van die raaklyn</i>	A CA A CA CA (5)
			[23]

QUESTION/VRAAG 7

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

<p>7.4</p>	$g'(x) = -3x^2 + 10x + 8 = 0$ $(3x + 2)(-x + 4) = 0 \text{ OR/OF } x = \frac{-(10) \pm \sqrt{(10)^2 - 4(-3)(8)}}{2(-3)}$ $\therefore x = -\frac{2}{3} \text{ or/of } x = 4$ $g\left(-\frac{2}{3}\right) = -\left(-\frac{2}{3}\right)^3 + 5\left(-\frac{2}{3}\right)^2 + 8\left(-\frac{2}{3}\right) - 12$ $= -\frac{400}{27} \approx -14,81$ $g(4) = -(4)^3 + 5(4)^2 + 8(4) - 12 = 36$ $\therefore \left(-\frac{2}{3}; -\frac{400}{27}\right) \text{ or/of } (4; 36)$ <p style="text-align: center;">OR/OF</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 ✓ both turning points/ beide draaipunte CA ✓ shape /vorm A</p> <p style="text-align: right;">(4)</p>

7.6	$-2 < x < 1$ or/of $x > 6$ <p style="text-align: center;">OR/OF</p> $x \in (-2; 1)$ or/of $(6; \infty)$ <p style="text-align: center;">OR/OF</p> $x > -2$ and/en $x < 1$ or/of $x > 6$	✓ endpoints/ <i>eindpunte</i> CA ✓ notation/ <i>notasie</i> A ✓ $x > 6$ CA <p style="text-align: center;">OR/OF</p> ✓ endpoints/ <i>eindpunte</i> CA ✓ notation/ <i>notasie</i> A ✓ $(6; \infty)$ CA <p style="text-align: center;">OR/OF</p> ✓ endpoints/ <i>eindpunte</i> CA ✓ notation/ <i>notasie</i> A ✓ $x > 6$ 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 (1)
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 (2)
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 A ✓ equating derivative to/ stel afgeleide gelyk aan 0 A ✓ S CA ✓ value of/ waarde van r CA ✓ value of/waarde van h CA NPU (5)
		[8]

QUESTION/VRAAG 9

<p>9.1.1</p>	$\int -4 dt$ $= -4t + C$	<p>✓ -4t A ✓ C A (2)</p>
<p>9.1.2</p>	$\int x^5 (x^3 - 9x^{-6}) dx$ $= \int (x^8 - 9x^{-1}) dx \quad \text{OR/OF} \quad \int \left(x^8 - 9\left(\frac{1}{x}\right) \right) dx$ $= \frac{x^9}{9} - 9 \ln x + C$	<p>✓ S A ✓ $\frac{x^9}{9}$ CA ✓ -9 ln x CA (3)</p>
<p>9.2 #</p>	<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>	<p>✓ Area notation using integrals/ Area-notasie met gebruik van integrale M A ✓ $-\frac{x^3}{3} + x^2 + 3x$ A ✓✓ SF CA ✓ $\frac{32}{3}$ or / of 10,67 units² / eenh² CA ✓ M A ✓ Area of/ oppervlakte van Δ A</p> <p>✓ $\frac{23}{3} \approx 7,67 \text{ units}^2 / \text{eenh}^2$ CA</p> <p style="text-align: center;">OR/OF</p>

