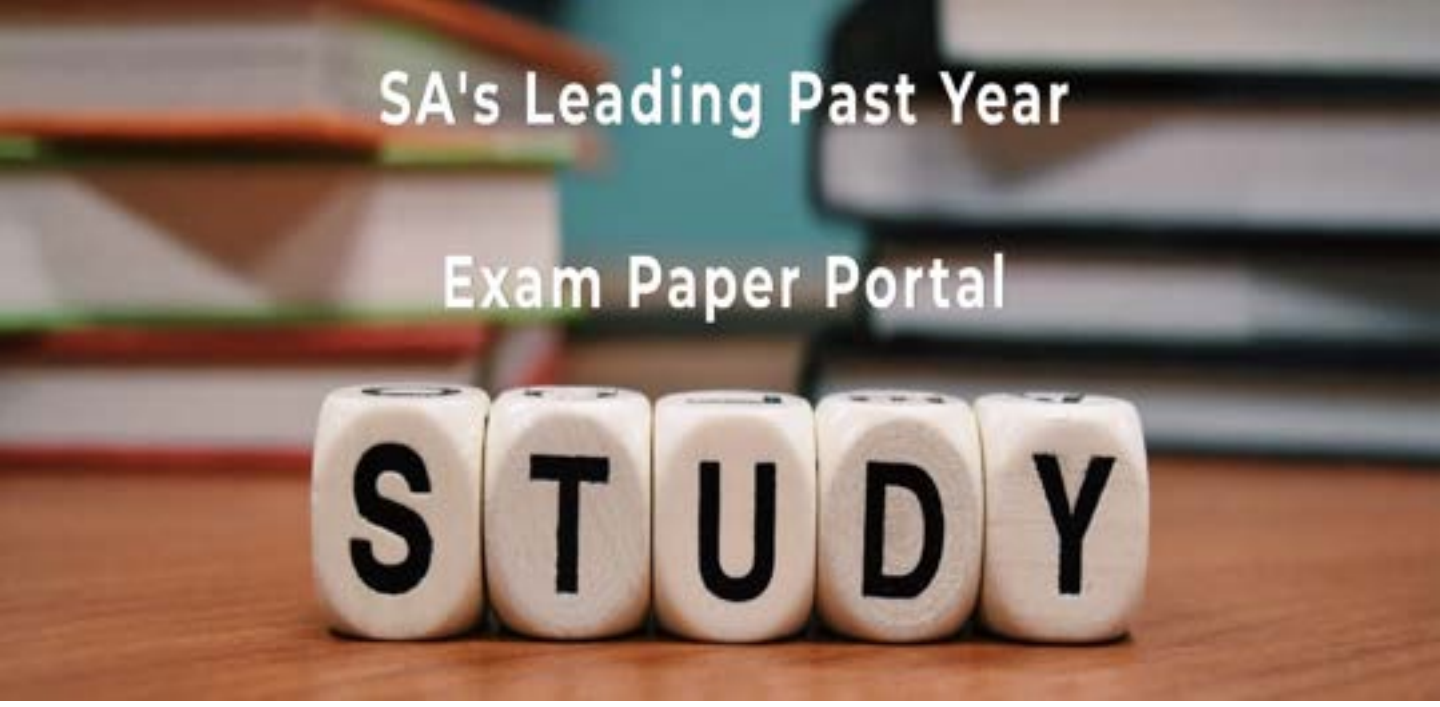

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GRADE 12/*GRAAD* 12

TECHNICAL MATHEMATICS P1/*TEGNIESE WISKUNDE V1*

NOVEMBER 2022

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

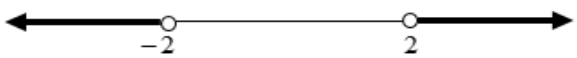
MARKING CODES/*NASIENKODES*	
A	Accuracy/*Akkuraatheid*
CA	Consistent accuracy/*Volgehoue akkuraatheid*
M	Method/*Metode*
R	Rounding/*Afronding*
NPR	No penalty for rounding/*Geen penalisering vir afronding nie*
NPU	No penalty for units omitted / *Geen penalisering vir eenhede weggelaat nie*
S	Simplification/*Vereenvoudiging*
SF	Substitution in correct formula/*Vervanging in korrekte formule*
PR	Penalty for rounding/*Penalisasie vir afronding*

These marking guidelines consist of 19 pages.
Hierdie nasienriglyne bestaan uit 19 bladsye.

NOTE:
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent accuracy marking to be applied where indicated.
- # Shows questions where Tolerance Range will be applied**:**
  Q 3.3 ; Q 5.3 ; Q 6.2.3 ; Q 9.1.3

LET WEL:
- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.*
- *Volgehoue akkuraatheidnasien moet toegepas word soos aangedui.*
- *# Toon vrae waar Toleransie Wydte (Verdraagsaamheids omvang) toegepas word**:***
  V 3.3 ; V 5.3 ; V 6.2.3 ; V 9.1.3

QUESTION/*VRAAG* 1

1.1.1	$x(7+x)=0$ $x=0$ or/*of* $x=-7$	✓ $x=0$ ✓ $x=-7$	**A** **A** (2)
1.1.2	$4x^2-5x-4=0$ $x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\dfrac{-(-5)\pm\sqrt{(-5)^2-4(4)(-4)}}{2(4)}$ **OR/*OF*** $=\dfrac{-(5)\pm\sqrt{(5)^2-4(-4)(4)}}{2(-4)}$ $\therefore x\approx 1,80$ or / *of* $x\approx -0,55$	✓ **SF** ✓ positive *x*- value / *positiewe x- waarde* ✓ negative *x*- value / *negatiewe x- waarde* **NPR** **AO** full marks /*volpunte*	**A** **CA** **CA** (3)
1.1.3	$2x^2-8>0$ $\quad 2(x^2-4)>0$ $2(x-2)(x+2)>0$ **OR/OF** $(x-2)(x+2)>0$ Critical values/*kritiese waardes*: 2 and/*en* -2 $\therefore x<-2$ or/*of* $x>2$ **OR/*OF*** $x\in(-\infty;-2)$ or/*of* $x\in(2;\infty)$ **OR/*OF***  	✓ factors/*faktore* Formula / *Formule* ✓Both critical values/ *beide kritiese waardes* ✓ notation/*notasie* **AO** full marks /*volpunte*	**A** **CA** **A** (3)

1.2	$y = 5x - 2$ and/*en* $y = x^2 + 4x - 8$ $x^2 + 4x - 8 = 5x - 2$ $x^2 - x - 6 = 0$ $(x-3)(x+2) = 0$ **OR/*OF*** $x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-6)}}{2(1)}$ $\therefore \quad x = 3 \quad$ or/*of* $\quad x = -2$ **OR/*OF*** $y = 5(3) - 2$ or/*of* $y = 5(-2) - 2$ **OR / *OF*** $y = (3)^2 + 4(3) - 8$ or/*of* $y = (-2)^2 + 4(-2) - 8$ $\therefore \; y = 13 \quad$ or/*of* $\quad y = -12$ **OR/*OF*** $x = \frac{y+2}{5}$ $y = \left(\frac{y+2}{5}\right)^2 + 4\left(\frac{y+2}{5}\right) - 8$ $y = \frac{y^2 + 4y + 4}{25} + \frac{4y + 8}{5} - 8$ $25y = y^2 + 4y + 4 + 20y + 40 - 200$ $y^2 - y - 156 = 0$ $(y-13)\,(y+12) = 0$ **OR/*OF*** $y = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-156)}}{2(1)}$ $\therefore y = 13 \quad$ or / *of* $\quad y = -12$ $x = \frac{13+2}{5}$ *or / of* $x = \frac{-12+2}{5}$ $\therefore x = 3 \quad$ and / *en* $\quad x = -2$	✓ equating/*gelykstel* **A** ✓ standard form/ *standaardvorm* **CA** ✓ factors or formula/ *faktore of formule* **CA** ✓ both *x*-values/ *beide x- waardes* **CA** ✓both *y*-values/ *beide y-waardes* **CA** **OR/*OF*** ✓ substitution/ *vervanging* **A** ✓ standard vorm/ *standaardvorm* **CA** ✓ factors or formula/ *faktore of formule* **CA** ✓both *y*-value/ *beide y-waardes* **CA** ✓both *x* values/ *beide x-waardes* **CA** (5)

1.3.1	$SV = \frac{\pi d^2 \times L}{4}$ $4SV = \pi\ d^2 \times L$ $\therefore \quad L = \frac{4\ SV}{\pi d^{\ 2}}$ **OR/*OF*** $\therefore L\ = \frac{SV}{\frac{\pi d^2}{4}}$	✓ **M** **A** ✓ *L* subject/*L-onderwerp* **CA** **AO** full marks /*volpunte* (2)
1.3.2	$L = \frac{4\ SV}{\pi d^{\ 2}}$ $= \frac{4 \times 1020,5}{\pi \times (10)^2}$ **OR / OF** $= \frac{4 \times 1020,5}{3,14 \times (10)^2}$ $\approx 13\ cm$ **OR/*OF*** $L\ = \frac{SV}{\frac{\pi d^2}{4}}$ $= \frac{1020,5}{\frac{\pi (10)^2}{4}}$ $\approx 13\ cm$ **OR/*OF*** $SV = \frac{\pi d^2 \times L}{4}$ $1020,5 = \frac{\pi (10)^2 \times L}{4}$ $L \approx 13\ cm$	✓ **SF** **CA** ✓ value of *L*/ *waarde v L* **CA** **OR/*OF*** ✓ **SF** **CA** ✓value of *L*/ *waarde v L* **CA** **OR/*OF*** ✓ **SF** **A** ✓value of *L*/ *waarde v L* **CA** **PR** *in this question only/ slegs in hierdie vraag* (2)

1.4.1	<table><tr><td></td><td>2^5</td><td>2^4</td><td>2^3</td><td>2^2</td><td>2^1</td><td>2^0</td><td></td></tr><tr><td>P</td><td></td><td></td><td>1</td><td>0</td><td>1</td><td>0</td><td>=10</td></tr></table>	✓ 10 **A** (1)
1.4.2	$1010_2 \times 10000_2 = 10100000_2$ **OR/OF** <table><tr><td></td><td>2^5</td><td>2^4</td><td>2^3</td><td>2^2</td><td>2^1</td><td>2^0</td><td></td></tr><tr><td>Q</td><td></td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>=16</td></tr></table> $P \times Q = 10 \times 16 = 160 = 10100000_2$ <table><tr><td>2^7</td><td>2^6</td><td>2^5</td><td>2^4</td><td>2^3</td><td>2^2</td><td>2^1</td><td>2^0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr></table>	✓✓ **A** **AO** full marks /*volpunte* ✓ 16 **A** ✓ 10100000_2 **CA** (2)
		[20]

QUESTION/*VRAAG* 2

2.1.1	$x^2 - 2x + 6 = 0$ $\Delta = b^2 - 4ac$ $= (-2)^2 - 4(1)(6)$ $= -20$	✓ **SF** **A** ✓ **S** **CA** **AO** full marks /*volpunte* (2)
2.1.2	Non-real/Imaginary/*Nie-reël/imaginêr*	✓ non-real/imaginary/ *nie-reël/imaginêr* **CA** (1)
2.2	$x^2 + 2x + k = 0$ $\Delta = (2)^2 - 4(1)(k)$ $(2)^2 - 4(1)(k) \geq 0$ $4 - 4k \geq 0$ $k \leq 1$	✓ **SF** **A** ✓ $\Delta \geq 0$ **A** ✓value(s) of *k*/ *waarde(s) van k* **CA** (3)
		[6]

QUESTION/*VRAAG* 3

3.1.1	$\frac{8\,x^3y^2}{16xy^4}$ $=\frac{x^2}{2y^2}$	✓ x^2 or/*of* $\frac{1}{2}x^2$ **A** ✓ $2\,y^2$ or/*of* y^2 **A** (2)
3.1.2	$\frac{\sqrt{48}+\sqrt{12}}{\sqrt{27}}$ $=\frac{4\sqrt{3}+2\sqrt{3}}{3\sqrt{3}}$ **OR/*OF*** $=\frac{2^2\sqrt{3}+2\sqrt{3}}{3\sqrt{3}}$ **OR/*OF*** $=\frac{6\sqrt{3}}{3\sqrt{3}}$ $=\frac{\sqrt{3}\,(4+2)}{3\sqrt{3}}$ $=\frac{3^{\frac{1}{2}}\,(4+2)}{3.3^{\frac{1}{2}}}$ $=2$ **OR/*OF*** $\frac{\sqrt{48}+\sqrt{12}}{\sqrt{27}}$ $=\frac{4\sqrt{3}}{3\sqrt{3}}+\frac{2\sqrt{3}}{3\sqrt{3}}$ $=\frac{6}{3}$ $=2$	✓simplified surd forms/ *vereenvoudigde wortelvorme* **A** ✓ **S** **CA** ✓ **S** **CA** **OR/*OF*** ✓simplified surd forms/ *vereenvoudigde wortelvorme* **A** ✓ **S** **CA** ✓ **S** **CA** **AO** one mark/*slegs een punt* (3)
3.2.1	$\log 25$ $=\log 5^2$ **OR/*OF*** $2\log 5$ **OR/*OF*** $\log 5+\log 5$ $=2m$	✓ log(exp) property/-*log(eksp,)eienskap* **A** ✓ **S** **CA** **AO** full marks /*volpunte* (2)
3.2.2	$\log 2$ $=\log\left(\frac{10}{5}\right)$ **OR/*OF*** $=\log 2+\log 5-\log 5$ $=\log 10-\log 5$ $=1-m$	✓ **M** **A** ✓log property/ *eienskap* **A** ✓ **S** **CA** **AO** full marks /*volpunte* (3)

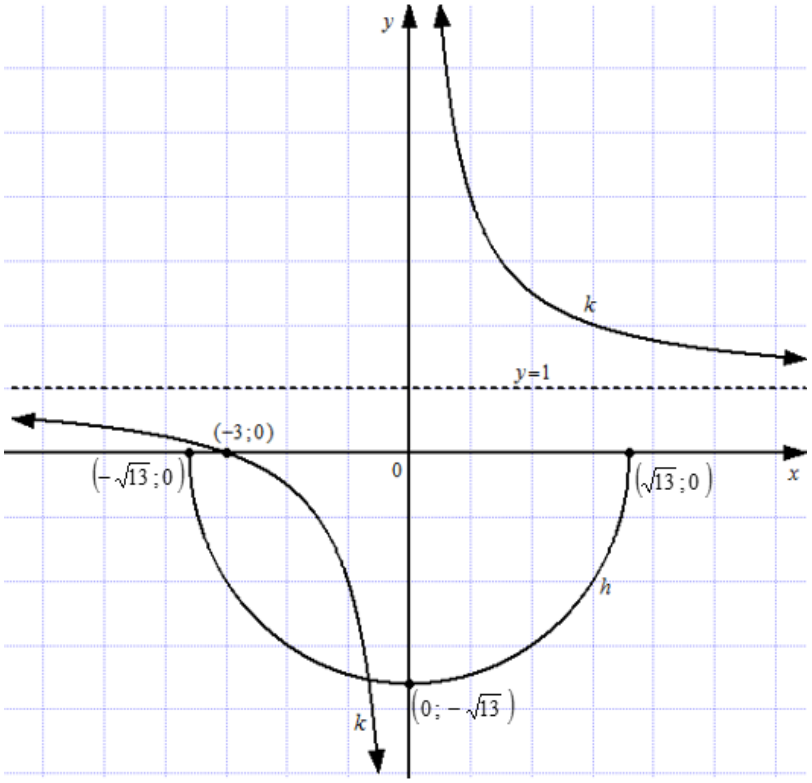
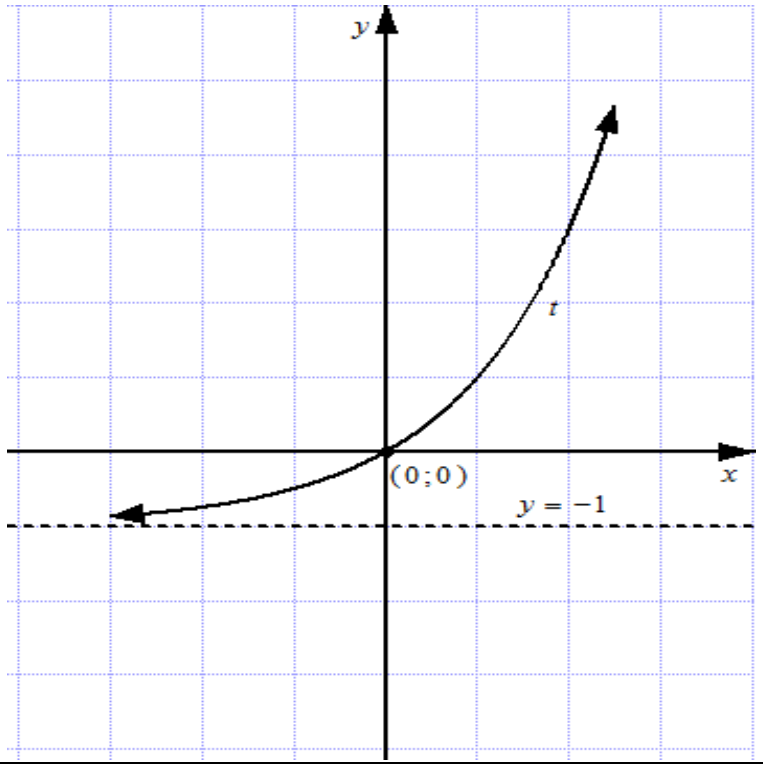
3.3	$\log_2(x+3) - 3 = -\log_2(x-4)$ $\log_2(x+3) + \log_2(x-4) = 3$ $\log_2(x+3)(x-4) = 3$ $(x+3)(x-4) = 2^3 = 8$ $x^2 - x - 12 = 8$ $x^2 - x - 20 = 0$ $(x+4)(x-5) = 0$ **OR/*OF*** $x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-20)}}{2(1)}$ $\therefore x = 5$ or/*of* $x \neq -4$ **OR/*OF***	✓ log property/-*eienskap* ✓ exponential form/ *eksponentvorm* ✓ standard form/ *standaardvorm* ✓ factors or formula/ *faktore of formule* ✓ correct value of/ *korrek waarde van x* **OR/*OF***	**A** **CA** **CA** **CA** **CA**
	$\log_2(x+3) - 3 = -\log_2(x-4)$ $\log_2(x+3) - 3\log_2 2 = \log_2(x-4)^{-1}$ $\log_2(x+3) - \log_2 8 = \log_2(x-4)^{-1}$ $\log_2 \frac{(x+3)}{8} = \log_2 \frac{1}{(x-4)}$ $\frac{x+3}{8} = \frac{1}{x-4}$ $(x+3)(x-4) = 1 \times 8$ $x^2 - x - 12 = 8$ $x^2 - x - 20 = 0$ $(x+4)(x-5) = 0$ **OR/*OF*** $x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-20)}}{2(1)}$ $\therefore x = 5$ or/*of* $x \neq -4$ **OR/*OF***	✓ log property/-*eienskap* ✓ log property/-*eienskap* ✓ standard form/ *standaardvorm* ✓ factors or formula/ *faktore of formule* ✓ correct value of/ *korrek waarde van x* **OR/*OF***	**A** **CA** **CA** **CA** **CA**

	$\log_2(x+3) = 3 - \log_2(x-4)$ $\log_2(x+3) = \log_2 8 - \log_2(x-4)$ $\log_2(x+3) = \log_2 \frac{8}{(x-4)}$ $\frac{x+3}{1} = \frac{8}{x-4}$ $(x+3)(x-4) = 8$ $x^2 - x - 12 = 8$ $x^2 - x - 20 = 0$ $(x+4)(x-5) = 0$ **OR/*OF*** $x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-20)}}{2(1)}$ $\therefore x = 5$ or/*of* $x \neq -4$	✓ log property/*-eienskap* ✓ log property/*-eienskap* ✓ standard form/ *standaardvorm* ✓ factors or formula/ *faktore of formule* ✓ correct value of/ *korrek waarde van x*	**A** **CA** **CA** **CA** **CA** (5)
3.4.1	$\bar{z} = -1 - 3i$	✓conjugate/*toegevoegde*	**A** (1)
3.4.2	$z_2 = \sqrt{2}\,cis\,135° = \sqrt{2}\cos 135° + i\sqrt{2}\sin 135°$ $= -1 + i$	✓ expansion/*uitbreiding* ✓ $-1+i$ **AO** full marks /*volpunte*	**A** **A** (2)
3.4.3	$z_1 - z_2$ $= -1 + 3i - (-1+i)$ **OR/*OF*** $-1 + 3i - \sqrt{2}\,cis135°$ $= 2i$	✓substitution/*vervanging* ✓**S** **AO** full marks /*volpunte*	**CA** **CA** (2)
3.5	$x + yi - (1-i) = 4 + 5i$ $x + yi - 1 + i = 4 + 5i$ $x + yi = 5 + 4i$ $\therefore x = 5$ and/*en* $y = 4$ **OR/*OF*** $x + yi - (1-i) = 4 + 5i$ $x + yi - 1 + i = 4 + 5i$ $(x-1) + (y+1)i = 4 + 5i$ $x - 1 = 4$ and/*en* $y + 1 = 5$	✓ **S** ✓ **S** ✓ value of *x*/*waarde van x* ✓ value of *y*/*waarde van y* **OR/*OF*** ✓ **S** ✓ **S** ✓ value of *x*/*waarde van x* ✓ value of *y*/*waarde van y*	**A** **CA** **CA** **CA** **A** **CA** **CA** **CA** (4)
			[24]

QUESTION/*VRAAG* 4

4.1.1(a)	$y \geq -9$ **OR/OF** $y \in [-9;\infty)$ **OR/OF** $-9 \leq y < \infty$	✓ $y \geq -9 / y \in [-9;\infty)$ / $-9 \leq y < \infty$	**A** (1)
4.1.1(b)	$Q(4;-5)$	✓ $x = 4$ ✓ $y = -5$	**A** **A** (2)
4.1.2(a)	$f(x) = x^2 - 4x - 5$ $x-$int s./ *afsn.*: $x^2 - 4x - 5 = 0$ $(x+1)(x-5) = 0$ **OR/*OF*** $x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-5)}}{2(1)}$ $x = -1$ *or / of* $x = 5$	✓ $y = 0$ ✓factors/form/ *faktore/formule* ✓ both values of *x*/ *beide waardes van x* **AO** full marks /*volpunte*	**A** **A** **CA** (3)
4.1.2(b)	The length of/*lengte van* AB $= 6$ units/*eenhede*	✓6	**CA** (1)
4.1.3	$g(x) = mx + c$ through/*deur* $A(-1;0)$; Q (4;–5) $m = \frac{y_1 - y_2}{x_1 - x_2} = \frac{-5-0}{4-(-1)}$ $= -1$ $g(x) = -1x + c$ **OR/*OF*** $y - y_1 = -1(x - x_1)$ subst./ *verv.*: $(-1;0)$ $0 = -1(-1) + c$ $y - 0 = -1(x+1)$ $c = -1$ **OR/*OF*** subst./ *verv.*: $(4;-5)$ $-5 = -1(4) + c$ **OR/*OF*** $y - (-5) = -1(x-4)$ $c = -1$	✓ **SF** ✓ $m = -1$ **Must be negative/** ***Moet negatief wees*** ✓ $c = -1$	**CA** **CA** **CA** (3)

4.1.4	$x<5\ ;\ x\neq -1$ **OR/*OF*** $x\in(-\infty;5);\ x\neq -1$ **OR/*OF*** $x\in(-\infty;-1)$ or/*of* $(-1\ ;\ 5)$	✓ $x<5$ ✓ $x\neq -1$ **OR/*OF*** ✓ $(-\infty;5)$ ✓ $x\neq -1$ **OR/*OF*** ✓ $(-\infty;-1)$ ✓ $(-1\ ;\ 5)$	**CA** **CA** **CA** **CA** **CA** **CA** (2)
4.2.1	$-\sqrt{13}\leq x\leq\sqrt{13}$ **OR/*OF*** $x\in[\ -\sqrt{13};\ \sqrt{13}\ ]$ **OR/*OF*** $-3,61\leq x\leq 3,61$ **OR/*OF*** $x\in[-3,61;3,61]$ **OR/OF** $x\geq -3,61$ and/*en* $x\leq 3,61$ **OR/OF** $x\geq -\sqrt{13}$ and/*en* $x\leq\sqrt{13}$	✓ critical values/ *kritiese waardes* ✓ notation/*notasie*	**A** **A** (2)
4.2.2(a)	$x=0\ ;\ y=1$	✓ $x=0$ ✓ $y=1$	**A** **A** (2)
4.2.2(b)	$0=\frac{3}{x}+1$ $-1=\frac{3}{x}$ $x=-3$	✓ $y=0$ ✓value of *x/waarde van x* **AO** full marks /*volpunte*	**A** **A** (2)

4.2.3		*k*: ✓ shape/*vorm* **A** ✓ *x*-int./*afsn.* **CA** ✓ asymptote/*asimptote* **CA** *h*: ✓ shape/*vorm* **A** ✓ both/*beide x*-int./*afsn.* **CA** (5)
4.3		✓ shape/*vorm* **A** ✓ (0;0) **A** ✓ asymptote/*asimptoot* **A** (3)
		[26]

QUESTION/*VRAAG* 5

5.1	$A = P(1+i)^n$ $= R\,8\,000\,(1+13\%)^3$ $\approx$ R 11 543,18	✓**F** ✓**SF** ✓ **S** **NPR**	**A** **A** **CA** (3)
5.2.1	10 621	✓ 10 621	**A** (1)
5.2.2	*g*	✓ *g*	**A** (1)
5.2.3	$A = P(1-i)^n$ $3459 = 10\,621(1-0,128)^n$ $\frac{3459}{10621} = (0,872)^n$ $n = \frac{\log\left(\frac{3459}{10621}\right)}{\log(0,872)}$ **OR/OF** $n = \log_{0,872}\frac{3459}{10621}$ $\therefore\ n \approx 8,1905$ years/*jaar*	✓**F** ✓ **SF** ✓ **S** ✓ log form/*-vorm* ✓ value of/*waarde van n* **NPR**	**A** **A** **CA** **CA** **CA** (5)
5.3 #	Value of investment end of 24 months/ *Waarde van belegging einde van 24 maande*: $\approx$ R22543,19552 Invested/*Belê* R5 000 R22 543,19552 + R 5 000 $\approx$ R27 543,19552 Value of investment end of 5 years/ *Waarde van belegging einde van* 5 *jaar*: $A = P(1+i)^n = 27543,19552\left(1+\frac{5\%}{2}\right)^{3\times 2}$ $\approx$ R31941,66 $\therefore$ R31941,66 < R35000 He will **NOT** have enough money/*Hy sal **NIE** genoeg geld hê NIE.* **OR/*OF***	$A = P(1+i)^n = R20\,000\left(1+\frac{6\%}{12}\right)^{2\times 12}$ ✓ **SF** ✓**M** + R5 000 ✓ **SF** ✓ R 31941, 66 ✓conclusion/*gevolgtrekking* **OR/*OF***	**A** **A** **CA** **CA** **CA**

	$A = R20\,000\left(1+\frac{6\%}{12}\right)^{2\times12}\left(1+\frac{5\%}{2}\right)^{2\times3}$ $+ R5000\left(1+\frac{5\%}{2}\right)^{2\times3}$ $\approx R31941,66$ $\therefore\ R31941,66 < R35\,000$ He will **NOT** have enough money/*Hy sal **NIE** genoeg geld hê NIE.* **OR/*OF*** $P = \frac{R35\,000}{\left(1+\frac{6\%}{12}\right)^{2\times12}\left(1+\frac{5\%}{2}\right)^{2\times3}}$ $= \frac{5000}{\left(1+\frac{6\%}{12}\right)^{2\times12}}$ $\approx R22339,68$ $\therefore\ R20\,000 < R22339,68$ He will **NOT** have enough money/*Hy sal **NIE** genoeg geld hê NIE.*	✓ $\left(1+\frac{6\%}{12}\right)^{2\times12}$ **A** ✓ $\left(1+\frac{5\%}{2}\right)^{2\times3}$ **A** ✓ **M** + R5 000 **A** ✓ R31941, 66 **CA** ✓conclusion/*gevolgtrekking* **CA** **OR/*OF*** ✓ $\left(1+\frac{6\%}{12}\right)^{2\times12}$ **A** ✓ $\left(1+\frac{5\%}{2}\right)^{2\times3}$ **A** ✓ **M** – R5 000 **A** ✓ R 22339,68 **CA** ✓conclusion/*gevolgtrekking* **CA** **NPR** (5)
			[15]

QUESTION/*VRAAG* 6

6.1	$f(x) = 5 - 8x$ $f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h\to 0} \frac{5 - 8(x+h) - (5 - 8x)}{h}$ $= \lim_{h\to 0} \frac{5 - 8x - 8h - 5 + 8x}{h}$ $= \lim_{h\to 0} \frac{-8h}{h}$ $= \lim_{h\to 0} (-8)$ $f'(x) = -8$	✓ definition/*definisie* ✓ **SF** ✓ **S** ✓ **S** ✓ -8 **Penalty** of one mark for incorrect notation *Penaliseer een punt indien notasie foutief is.* **AO** only one mark/*slegs een punt*	**A** **A** **CA** **CA** **CA** (5)
6.2.1	$f(x) = 3x^5 + \pi x$ $f'(x) = 15x^4 + \pi$	✓ $15x^4$ ✓ π	**A** **A** (2)
6.2.2	$y = x^2\left(4x - 2x^{-1}\right)$ $y = 4x^3 - 2x$ $\frac{dy}{dx} = 12x^2 - 2$	✓ **S** ✓ $12x^2$ ✓ -2	**A** **CA** **CA** (3)
6.2.3 #	$D_x\left[\sqrt[5]{x^4} - \frac{2}{5x^2} + 8t^4x\right]$ $= D_x\left[x^{\frac{4}{5}} - \frac{2}{5}x^{-2} + 8t^4x\right]$ $= \frac{4}{5}x^{-\frac{1}{5}} + \frac{4}{5}x^{-3} + 8t^4$	✓ $x^{\frac{4}{5}}$ ✓ $-\frac{2}{5}x^{-2}$ ✓ $\frac{4}{5}x^{-\frac{1}{5}}$ ✓ $\frac{4}{5}x^{-3}$ ✓ $8t^4$	**A** **A** **CA** **CA** **CA** (5)
6.3.1	$g'(x) = 12x + 3$ $\therefore 12(p) + 3 = -21$ $12p = -24$ $p = -2$	✓ derivative of/*afgeleide van g* ✓ equat.deriv/*afgeleide* = – 21 ✓ $p = -2$	**A** **A** **CA** (3)
6.3.2	$y = 6(-2)^2 + 3(-2)$ $\therefore y = 18$ $y = mx + c$ **OR/*OF*** $y - y_1 = m(x - x_1)$ $18 = -21(-2) + c$ $y - 18 = -21(x + 2)$ $c = -24$ $y - 18 = -21 - 42$ $\therefore y = -21x - 24$	✓ *y* coordinate/*y-koördinaat* ✓ **SF** ✓ eqn. of tangent/*vergelyk. van raaklyn*	**CA** **CA** **CA** (3)
			[21]

QUESTION/*VRAAG* 7

7.1	OA = 1 unit/*eenheid*	✓length/*lengte*	**A** (1)
7.2	$0 = (1)^3 + 3(1)^2 - 9(1) + k$ $\therefore k = 5$	✓ subst./*verv.* $A(1;0)$	**A** (1)
7.3	x-intercepts/*afsnitte*; $y = 0$ $(x-1)(x-1)(x+5) = 0$ $\therefore B(-5;0)$ **OR/*OF*** $(x-1)(x^2+4x-5) = 0$ **OR/*OF*** $(x+5)(x^2-2x+1) = 0$ $(x-1)(x-1)(x+5) = 0$ $\therefore x = 1$ or/*of* $x = -5$ $\therefore B(-5;0)$	✓ $(x-1)$ **A** ✓ $(x-1)(x+5)$ **A** ✓ x- coordinates of B/ *koördinate van B* **CA** ✓ y-coordinates of B/ *koördinate van B* **A** **OR/*OF*** ✓ linear factor/ **A** ✓ quadratic factor/ **A** ✓ x- coordinates of B/ *koördinate van B* **CA** ✓ y-coordinates of B/ *koördinate van B* **A** **AO** full marks /*volpunte*	(4)
7.4	$f'(x) = 3x^2 + 6x - 9 = 0$ $x^2 + 2x - 3 = 0$ $(x+3)(x-1) = 0$ **OR/*OF*** $x = \frac{-(2) \pm \sqrt{(2)^2 - 4(1)(-3)}}{2(1)}$ $\therefore x = -3$ or/*of* $x = 1$ $f(-3) = (-3)^3 + 3(-3)^2 - 9(-3) + 5$ $= 32$ $\therefore D(-3;\ 32)$	✓derivative/*afgeleide* **A** ✓equating derivative to 0/ *stel afgeleide gelyk aan 0* **A** ✓factors/formula/*faktore/ formule* **CA** ✓x value of D/ *x-waarde van D* **CA** ✓ y value of D/ *waarde van D* **CA** **AO** two marks/*twee punte*	(5)

7.5	$-3 \leq x \leq 1$ **OR/*OF*** $x \in [-3\ ;1]$ **OR/*OF*** $x \geq -3$ and/*en* $x \leq 1$	✓ critical values/ *kritiese waardes* ✓ notation/*notasie*	**CA** **A** (2)
7.6	$(1\ ;-2)$	✓ *x* coordinate/ *-koördinaat* ✓*y* coordinate/ *-koördinaat*	**A** **A** (2)
			[15]

QUESTION/*VRAAG* 8

8.1	$37,5\ °C$	✓ $37,5\ °C$ **NPU**	**A** (1)
8.2	$T'(t) = 7 - t$ $T'(4) = 7 - (4)$ $= 3\ ^oC/s$	✓ derivative/*afgeleide* ✓ Subst./*verv.* $t = 4$ ✓ $3\ ^oC/s$ **NPU**	**A** **A** **CA** (3)
8.3	$7 - t = 0$ **OR/*OF*** $t = \frac{-(7)}{2\left(-\frac{1}{2}\right)}$ $\therefore t = 7s$ $T(7) = 37,5 + 7(7) - 0,5(7)^2 = 62\ ^oC$	✓ $7 - t = 0$ / $t = \frac{-(7)}{2\left(-\frac{1}{2}\right)}$ ✓ $t = 7s$ ✓ $62\ ^oC$ **NPU**	**A** **CA** **CA** (3)
8.4	$7 - t < 0$ $\therefore t > 7$ $7 < t \leq 10$ **OR/*OF*** $t \in (7;10]$ **OR/OF** $t > 7$ and/*en* $t \leq 10$	✓ $t > 7$ ✓ restricting to 10/ *beperking tot* 10 **AO** full marks /*volpunte*	**CA** **A** (2)
			[9]

QUESTION/*VRAAG* 9

9.1.1	$\int 3x^{-1}\,dx$ $= 3\ln x + C$	✓ $3\ln x$ **A** ✓ C **A** (2)
9.1.2	$\int\left(4+2^{-x}\right)dx$ $=4x - \frac{2^{-x}}{\ln 2} + C$ **OR/*OF*** $4x + \frac{2^{-x}}{\ln 2^{-1}} + C$ **OR/*OF*** $=4x - \frac{\left(\frac{1}{2}\right)^x}{\ln 2} + C$ **OR/*OF*** $4x + \frac{\left(\frac{1}{2}\right)^x}{\ln\frac{1}{2}} + C$	✓$4x$ **A** ✓value of 2nd integral/ *waarde van die tweede integraal* **A** If C is omitted : NO penalty/ *Indien C weggelaat is : GEEN penalisering* (2)
9.1.3 #	$\int \frac{8x^4 - x^2}{2x}\,dx$ $=\int\left(4x^3 - \frac{1}{2}x\right)dx$ $= x^4 - \frac{1}{4}x^2 + C$	✓ **S** **A** ✓ x^4 **CA** ✓$-\frac{1}{4}x^2$ **CA** **No simplification: 0 marks/** ***Geen vereenvoudiging: 0 punte*** No penalty if C omitted/*Geen penalisering indien C uitgelaat* (3)
9.2	$A = \int_2^4 h(x)\,dx = \int_2^4\left(-x^2+2x+8\right)dx$ $=\left[-\frac{x^3}{3} + x^2 + 8x\right]_2^4$ $=\left[-\frac{(4)^3}{3}+(4)^2+8(4)\right]-\left[-\frac{(2)^3}{3}+(2)^2+8(2)\right]$ $= \frac{28}{3} \approx 9,33$ $\therefore \frac{\left(\frac{28}{3}\right)}{36}\times 100\% \approx 25,93\%$ **OR/*OF*** $20\%\times 36=\left(\frac{36}{5}\right)=7,2$ 25,93 % > 20 % $7,2 < 9,33$ ∴ The learner's statement is **NOT** correct/ *Die leerder se bewering is **NIE** korrek nie.*	✓Area notation using integrals/*Oppervlakte-notasie met gebruik van integrale* **A** ✓ $-\frac{x^3}{3}+x^2+8x$ **A** ✓✓**SF** **CA** ✓ area */oppervlakte* **CA** ✓ % calculation / *berekening* **CA** ✓conclusion/ *Afleiding.* **CA**

	OR/*OF*	**OR/*OF***	
	$A = 36 - \int_{-2}^{2} h(x)\,dx = 36 - \int_{-2}^{2} \left(-x^2+2x+8\right)dx$	✓Area notation using intergrals/ *Oppervlakte - notasie met gebruik van integrale*	**A**
	$=36 - \left[-\frac{x^3}{3}+x^2+8x\right]_{-2}^{2}$	✓ $-\frac{x^3}{3}+x^2+8x$	**A**
	$=36 - \left[-\frac{(2)^3}{3}+(2)^2+8(2)\right] - \left[-\frac{(-2)^3}{3}+(-2)^2+8(-2)\right]$	✓ ✓**SF**	**CA**
	$= \frac{28}{3} \approx 9,33$	✓ area/*oppervlakte*	**CA**
	$\therefore \frac{\left(\frac{28}{3}\right)}{36} \times 100\% \approx 25,93\%$ **OR/*OF*** $20\% \times 36 = \left(\frac{36}{5}\right) = 7,2$ 25,93 % > 20 % 7,2 < 9,33	✓ % calculation / *berekening*	**CA**
	∴ The learner's statement is **NOT** correct/ *Die leerder se bewering is **NIE** korrek nie.*	✓conclusion/ afleiding	**CA** (7)
			[14]
			TOTAL/*TOTAAL*: 150