basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE
NASIONALE SENIOR SERTIFIKAAT

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* $x=-8$	✓$\frac{7}{3}\approx 2,33$ **A** ✓-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* $x\approx -0,08$	✓ std form/vorm **A** ✓ **SF** **CA** ✓ **S** ✓x - value/*waarde* **CA** (4)

1.1.3	$-x^2+16>0$ $(x-4)(x+4)<0$ **OR/*OF*** $(-x+4)(x+4)>0$ **OR/*OF*** $-(x-4)(x+4)>0$ **OR/*OF*** $(-x-4)(x-4)>0$ **OR/*OF*** $x=\frac{-(0)\pm\sqrt{(0)^2-4(1)(-16)}}{2(1)}$ Critical values/ *kritiese waardes*: 4 and/*en* -4 $\therefore -4<x<4$ **OR/*OF*** $x\in(-4;4)$ **OR/*OF*** $x>-4$ and/*en* $x<4$ **OR/*OF***  	✓ **M** **A** ✓ critical values/ *kritiese waardes* **CA** ✓ correct notation/ *korrekte notasie* / correct graphical solution/ *korrekte grafiese oplossing* **A** **AO: Full marks/*Volpunte*** (3)

1.2	$x-y=1$ and/en $x+2xy+y^2=9$	
	$x=y+1$	✓ subject/ *onderwerp* **A**
	$(y+1)+2y(y+1)+y^2=9$	✓subst./ *vervang* **CA**
	$y+1+2y^2+2y+y^2=9$	
	$3y^2+3y-8=0$	✓std form/vorm **CA**
	$y=\frac{-(3)\pm\sqrt{(3)^2-4(3)(-8)}}{2(3)}=\frac{-3\pm\sqrt{105}}{6}$	✓ **SF** **CA**
	$\therefore\ y\approx 1,21$ or/of $y\approx -2,21$	✓ both *y*-values/*beide y-wrdes* **CA**
	$\therefore\ x\approx 1,21+1=2,21$ or/*of* $x\approx -2,21+1=-1,21$	✓both *x*-values/*beide x-wrdes* **CA**
	OR/*OF*	**OR/*OF***
	$y=x-1$	
	$x+2x(x-1)+(x-1)^2=9$	✓ subject/ *onderwerp* **A**
	$x+2x^2-2x+x^2-2x+1=9$	✓subst../ *vervang* **CA**
	$3x^2-3x-8=0$	✓ std form/vorm **CA**
	$x=\frac{-(-3)\pm\sqrt{(-3)^2-4(3)(-8)}}{2(3)}=\frac{3\pm\sqrt{105}}{6}$	✓ **SF** **CA**
	$\therefore\ x\approx 2,21$ or/*of* $x\approx -1,21$	✓ both *x*-values/*beide x-wrdes* **CA**
	$\therefore\ y\approx 2,21-1=1,21$ or/*of* $y\approx -1,21-1=-2,21$	✓both *y*-values/*beide y-wrdes* **CA**
		(6)

1.3.1 #	$f_r = \frac{1}{2\pi\sqrt{LC}}$ $\sqrt{LC} = \frac{1}{2\pi f_r}$ **OR/*OF*** $f_r \times 2\pi\sqrt{LC} = 1$ $LC = \left(\frac{1}{f_r \times 2\pi}\right)^2$ $L = \left(\frac{1}{f_r \times 2\pi}\right)^2 \div C$ **OR/*OF*** $f_r = \frac{1}{2\pi\sqrt{LC}}$ $(f_r)^2 = \frac{1}{4\pi^2 LC}$ $LC = \frac{1}{4\pi^2 (f_r)^2}$ $L = \frac{1}{4\pi^2 (f_r)^2 C}$ **OR/*OF*** $f_r = \frac{1}{2\pi\sqrt{LC}}$ $\sqrt{L} = \frac{1}{2\pi f_r\sqrt{C}}$ $\left(\sqrt{L}\right)^2 = \left(\frac{1}{2\pi f_r\sqrt{C}}\right)^2$ $L = \frac{1}{4\pi^2 (f_r)^2 C}$	✓ $\sqrt{LC}$ the subject/ *die onderwerp* / Cross Multiplication/ *Kruisvermenigvuldiging* **A** ✓squaring both sides/ *kwadr beide kante* **A** ✓ *L* subject/ *onderwerp* **CA** **OR/*OF*** ✓squaring both sides/ *kwadr beide kante* **A** ✓ LC the subject/ *die onderwerp* **CA** ✓ *L* the subject/ die *onderwerp* **CA** **OR/*OF*** ✓ $\sqrt{L}$ the subject/ *die onderwerp* **A** ✓squaring both sides/ *kwadr beide kante* **A** ✓ *L* the subject/ die *onderwerp* **CA** (3)

1.3.2	$L = \left(\frac{1}{f_r \times 2\pi}\right)^2 \div C$ **OR/*OF*** $L = \left(\frac{1}{f_r \times 2\pi\sqrt{C}}\right)^2$ $= \left(\frac{1}{1{,}59 \times 2\pi}\right)^2 \div \left(0{,}65 \times 10^{-6}\right)$ **OR/*OF*** $= \left(\frac{1}{1{,}59 \times 2\pi\sqrt{0{,}65 \times 10^{-6}}}\right)^2$ $\approx$ 15414,61 H **OR/*OF*** $f_r = \frac{1}{2\pi\sqrt{LC}}$ $1{,}59 = \frac{1}{2\pi\sqrt{L \times 0{,}65 \times 10^{-6}}}$ $L \approx$ 15414,61 H	✓ **SF** **CA** ✓**S** **CA** **OR/*OF*** ✓ **SF** **A** ✓**S** **CA** (2)
1.4	$24 = 11000_2$	✓ binary/ *binêre* **A** (1)
1.5	$144 \div 110_2$ $= 144 \div 6 = 24$ **OR/*OF*** $144 = 10010000_2$ $10010000_2 \div 110_2 = 11000_2 = 24$	✓6 **A** ✓ 24 **CA** **OR/*OF*** ✓ 10010000_2 **A** ✓ 24 **CA** **AO: Full marks/*Volpunte*** (2)
		[23]

QUESTION/*VRAAG* 2

2.1.1	$\Delta = b^2 - 4ac$ $= (-4)^2 - 4(1)(q)$ $= (-4)^2 - 4(1)(4)$ $= 0$	✓ **SF** **A** ✓value of discriminant/ *waarde van diskriminant* **CA** (2)
2.1.2	Equal , real and rational / *Gelyk, reëel en rasionaal*	✓ Equal , real and rational/ *Gelyk, reëel en rasionaal* **CA** (1)
2.2	$x^2 - 4x + p = 0$ $\Delta = b^2 - 4ac$ $= (-4)^2 - 4(1)(p)$ $= 16 - 4p$ $\Delta < 0$ $16 - 4p < 0$ $p > 4$	✓**SF** **A** ✓ $\Delta < 0$ **A** ✓ value(s) of/ *waardes van* p **CA** **AO: Full marks/*Volpunte*** (3)
		[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	$\sqrt{5x}\left(\sqrt{45x}+2\sqrt{80x}\right)$ $=\sqrt{5x}\left(\sqrt{5\times9x}+2\sqrt{5\times16x}\right)$ **OR/*OF*** $\sqrt{5x}\left(3\sqrt{5x}+8\sqrt{5x}\right)$ $=\sqrt{5x}\left(11\sqrt{5x}\right)$ **OR/*OF*** $3\times5x+2\times4\times5x$ $=55\,x$ **OR/*OF*** $\sqrt{5x}\left(\sqrt{45x}+2\sqrt{80x}\right)$ $=\sqrt{225x^2}+2\sqrt{400x^2}$ $=15x+2(20)x$ $=55\,x$	✓simplified surd/expanded surd vorm/ *vereenv wrtlvorm/ uitgebreide wrtlvorm* **A** ✓**S** **CA** ✓ **S** **CA** **OR/*OF*** ✓Expansion/*Uitbreiding* **A** ✓**S** **CA** ✓ **S** **CA** **AO 1 mark /*punt*** (3)
3.1.3	$\left(\frac{4^{3n-2}}{2^{3n+2}\cdot 8^{n-3}}\right)\times 8$ $=\left(\frac{\left(2^2\right)^{3n-2}}{2^{3n+2}\cdot\left(2^3\right)^{n-3}}\right)\times 2^3$ $=\left(\frac{2^{6n-4}}{2^{3n+2}\cdot 2^{3n-9}}\right)\times 2^3$ $=2^{6n-4-3n-2-3n+9+3}$ $=2^6$ **OR/*OF*** 64	✓prime bases/ *priemgrontal* **A** ✓exponential property/ *eksp eienskp* **CA** ✓ **S** **CA**

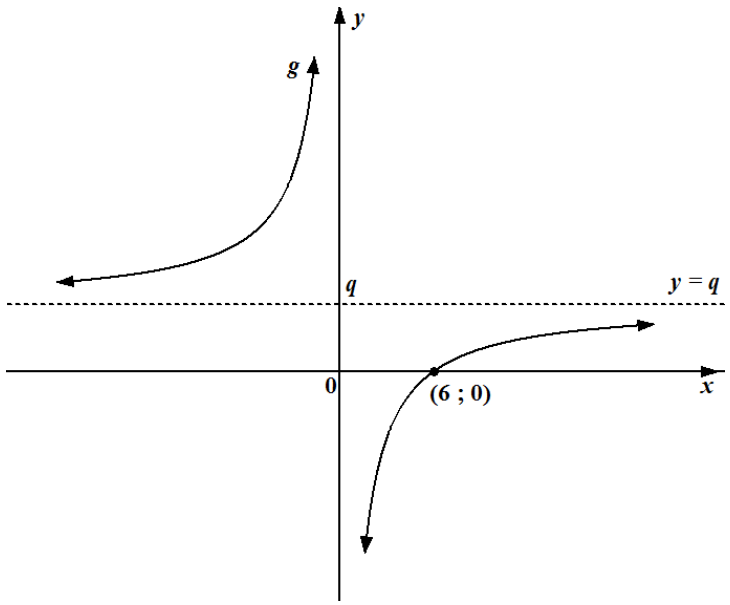
	OR/*OF*	**OR/*OF***
	$\left(\frac{4^{3n-2}}{2^{3n+2}\cdot 8^{n-3}}\right)\times 8$	
	$=4^{3n-2}\cdot 2^{-3n-2}\cdot 8^{-n+3}\times 8$	
	$=\left(2^2\right)^{3n-2}\cdot 2^{-3n-2}\cdot \left(2^3\right)^{-n+3}\times \left(2^3\right)$	✓prime bases/ *priemgrontal* **A**
	$=2^{6n-4-3n-2-3n+9+3}$	✓exponential property/ *eksp eienskp* **CA**
	$=2^6$ **OR/*OF*** 64	✓ **S** **CA**
		(3)
3.2	$\log(2x-5)+\log 2=1$ $\log 2(2x-5)=1$ **OR/*OF*** $\log 2(2x-5)=\log 10$ $2(2x-5)=10^1$ $4x-10=10$ $\therefore x=5$	✓log prop../ *eienskap* **A** ✓ exponential form/ *eksp. vorm* **CA** ✓ **S** **CA** ✓ value of/ *waarde van x* **CA**
	OR/*OF*	**OR/*OF***
	$\log(2x-5)+\log 2=1$ $\log(2x-5)=\log 10-\log 2$ $\log(2x-5)=\log\frac{10}{2}$ $2x-5=5$ $\therefore x=5$	✓ $\log 10$ **A** ✓ log prop.../ *eienskap* **CA** ✓ **S** **CA** ✓ value of/ *waarde van x* **CA**
	OR/*OF*	**OR/*OF***
		✓ $\log 10$ **A** ✓ log prop.../ *eienskap* **CA** ✓ exponential form/ *eksp. vorm* **CA**

	$\log(2x-5)+\log 2=1$ $\log(2x-5)+\log 2-\log 10=0$ $\log\left(\frac{2(2x-5)}{10}\right)=0$ $\frac{4x-10}{10}=10^0$ $\frac{4x-10}{10}=1$ $4x-10=10$ $4x=20$ $x=5$ **OR/*OF*** $\log(2x-5)+\log 2=1$ $\log 2=\log 10-\log(2x-5)$ $\log 2=\log\frac{10}{(2x-5)}$ $2(2x-5)=10$ $\therefore x=5$ **OR/*OF*** $\log(2x-5)+\log 2=1$ $\log(2x-5)=1-\log 2$ $\log(2x-5)=0,6989.....$ $(2x-5)=10^{0,6989...}$ $2x-5=5$ $\therefore x=5$	✓ value of/ *waarde van x* **CA** **OR/*OF*** ✓ $\log 10$ **A** ✓ log prop.../ *eienskap* **CA** ✓ **S** **CA** ✓ value of/ *waarde van x* **CA** **OR/*OF*** ✓ **S** **A** ✓ exponential form/ *eksp. vorm* **CA** ✓ **S** **CA** ✓ value of/ *waarde van x* **CA** **AO: Full marks *Volpunte*** (4)
3.3.1	1st quadrant/ *kwadrant*	✓1st quadrant/ *kwadrant* **A** (1)
3.3.2	$r=\lvert z\rvert=\sqrt{(2)^2+(2)^2}$ $=\sqrt{8}$ **OR/*OF*** $2\sqrt{2}\approx 2,83$	✓ Pythagoras **A** ✓ modulus **CA** **AO: Full marks/*Volpunte*** (2)

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

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*** $y = \frac{4ac - b^2}{4a}$ $f(1) = -(1)^2 + 2(1) + 8$ $= \frac{4(-1)(8) - (2)^2}{4(-1)}$ $= 9$ 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)

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*** $\sqrt{4^2 - x^2}$ **AO: Full marks/*Volpunte***	**CA** **CA** (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*** $y = -4 + 3$ $= a^x - 1$ $\therefore \quad y = -1$	✓ $t = 3$ ✓ $y = -1$ **AO Full marks *Volpunte***	**A** CA (2)
4.3		*g*: ✓horizontal asymptote / *horisontale asimptoot* ✓ shape / *vorm* ✓ *x*- intercept / *afsnit*	**A** **A** **A** (3)
			[26]

QUESTION/*VRAAG* 5

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

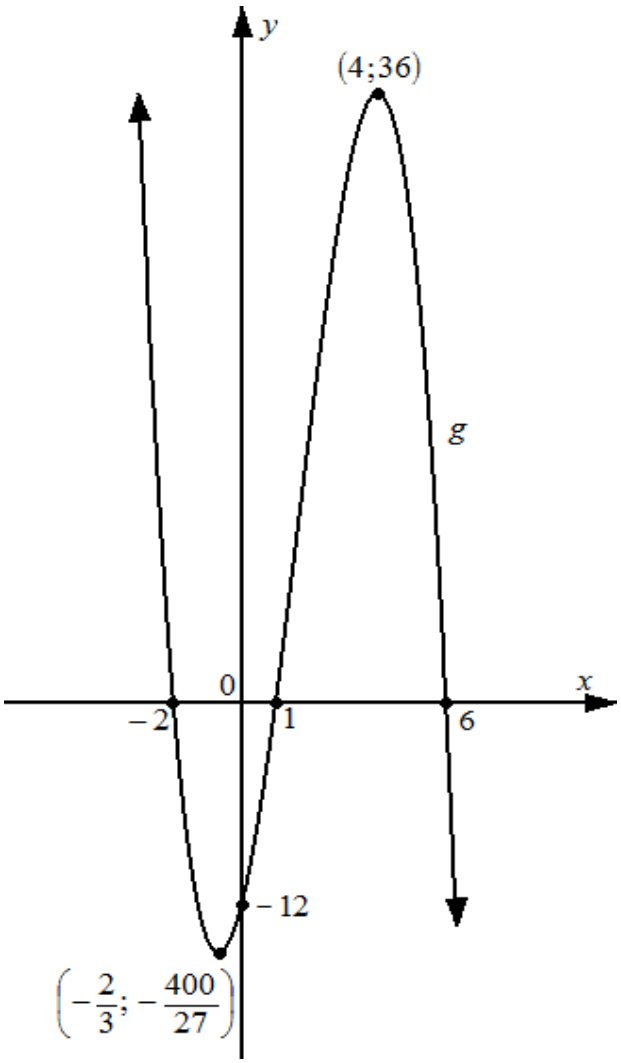
QUESTION/*VRAAG* 6

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

6.3.1	$\therefore h(1) = -2(1)^2 + (1) - 5 = -6$	✓ -6 **A** (1)
6.3.2	Av/*Ge.* gradient $= \frac{h(x_2) - h(x_1)}{x_2 - x_1}$ **OR/OF** $\frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{-26 - (-6)}{-3 - 1}$ $= 5$	✓ **F** **A** ✓ **SF** **CA** ✓ 5 **CA** (3)
6.4	$f(x) = x^3 + 2$ $f'(x) = 3x^2$ $m_t = f'(4) = 3(4)^2 = 48$ and $p(4) = (4)^3 + 2 = 66$ $\therefore y = mx + c$ **OR/*OF*** $y - y_1 = m(x - x_1)$ $66 = (48)(4) + c$ $y - (66) = 48(x - 4)$ $c = -126$ $y - 66 = 48x - 192$ $\therefore y = 48x - 126$	✓ derivative/ *afgeleide* **A** ✓ gradient **CA** ✓ *y*-coordinate/ *koordinaat* **A** ✓ **SF** **CA** ✓ Equation ot tangent/ *vergelyking van die raaklyn* **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** ✓✓✓ *x*- intercepts/ *afsnitte* **OR/*OF*** ✓ **M** ✓✓✓ *x*- intercepts/ *afsnitte* **OR/*OF*** ✓ **M** ✓✓✓ *x*- intercepts/ *afsnitte* **OR/*OF*** ✓ **M** ✓✓✓ *x*- intercepts/ *afsnitte* **OR/*OF*** ✓ **M** ✓✓✓ *x*- intercepts/ *afsnitte* **OR/*OF*** ✓ **M** ✓✓✓ *x*- intercepts/ *afsnitte* **AO Full marks /*Volpunte***	**A** **CA** **A** **CA** **A** **CA** **A** **CA** **A** **CA** (4)

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

7.6	$-2 < x < 1$ or/*of* $x > 6$ **OR/*OF*** $x \in (-2\,;1)$ or/*of* $(6\,;\infty)$ **OR/*OF*** $x > -2$ and/*en* $x < 1$ or/*of* $x > 6$	✓ endpoints/ *eindpunte* **CA** ✓ notation/ *notasie* **A** ✓ $x > 6$ **CA** **OR/*OF*** ✓ endpoints/ *eindpunte* **CA** ✓notation/ *notasie* **A** ✓ $(6\,;\infty)$ **CA** **OR/*OF*** ✓ endpoints/ *eindpunte* **CA** ✓ notation/ *notasie* **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** **A** ✓ **SF** . **A** (2)
8.3	$A(r) = 2\pi r^2 + 700r^{-1}$ $A'(r) = 4\pi r - 700r^{-2}$ $= 4\pi r - \frac{700}{r^2}$ For/ *vir* minimum: $A'(r) = 0$ $4\pi r - \frac{700}{r^2} = 0$ $4\pi r^3 - 700 = 0$ $r^3 = \frac{700}{4\pi}$ $r = \sqrt[3]{\frac{700}{4\pi}} \approx 3{,}82$ cm $h \approx \frac{350}{\pi(3{,}82)^2} \approx 7{,}63$ 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

9.1.1	$\int -4\,dt$ $= -4t + C$	✓ $-4t$ **A** ✓ C **A** (2)
9.1.2	$\int x^5\left(x^3 - 9x^{-6}\right)dx$ $= \int\left(x^8 - 9x^{-1}\right)dx$ **OR/*OF*** $\int\left(x^8 - 9\left(\frac{1}{x}\right)\right)dx$ $= \frac{x^9}{9} - 9\ln x + C$	✓ **S** **A** ✓ $\frac{x^9}{9}$ **CA** ✓ $-9\ln x$ **CA** (3)
9.2 #	Area bounded by curve and *x*- axis/ *oppervlakte begrens deur kromme en x-as:* $A = \int_{-1}^{3}\left(-x^2 + 2x + 3\right)dx$ $= \left[-\frac{x^3}{3} + x^2 + 3x\right]_{-1}^{3}$ $= \left[-\frac{(3)^3}{3} + (3)^2 + 3(3)\right] - \left[-\frac{(-1)^3}{3} + (-1)^2 + 3(-1)\right]$ $= \frac{32}{3}$ **OR/*OF*** $\approx 10{,}67$ *units*^{2} / *eenh*^{2} Area/*Oppervlak* ΔOEC: $= \frac{1}{2}\times 2\times 3$ **OR/*OF*** $= \int_0^2\left(-\frac{3}{2}x + 3\right)dx$ $= \left[-\frac{3}{4}x^2 + 3x\right]_0^2$ $= 3$ *units*^{2} / *eenh*^{2} Total shaded Area/ *Totale gearseerde oppervlakte* $= \frac{32}{3} - 3$ *units*^{2} / *eenh*^{2} $= \frac{23}{3}$ **OR/*OF*** $\approx 7{,}67$ *units*^{2} / *eenh*^{2} **OR/*OF***	✓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 *units*^{2} / *eenh*^{2} **CA** ✓**M** **A** ✓ Area of/ *oppervlakte van* Δ **A** ✓ $\frac{23}{3} \approx 7{,}67$ *units*^{2} / *eenh*^{2} **CA** **OR/*OF***

$A = \int_{-1}^{0} \left(-x^2 + 2x + 3\right) dx$

$= \left[-\frac{x^3}{3} + x^2 + 3x\right]_{-1}^{0}$

$= \left[-\frac{(0)^3}{3} + (0)^2 + 3(0)\right] - \left[-\frac{(-1)^3}{3} + (-1)^2 + 3(-1)\right]$

$= \frac{5}{3}$ **OR/*OF*** $\approx 1{,}67$ *units / eenh*^{2}

✓Area notation using integrals/ *Area-notasie met gebruik van integrale* **M** **A**

✓ $-\frac{x^3}{3} + x^2 + 3x$ **A**

✓✓ **SF** **CA**

$A = \int_{0}^{2} \left(-x^2 + 2x + 3\right) dx$

$= \left[-\frac{x^3}{3} + x^2 + 3x\right]_{0}^{2}$

$= \left[-\frac{(2)^3}{3} + (2)^2 + 3(2)\right] - \left[-\frac{(0)^3}{3} + (0)^2 + 3(0)\right]$

$= \frac{22}{3}$ **OR/*OF*** $\approx 7{,}33$ *units / eenh*^{2}

$A = \int_{2}^{3} \left(-x^2 + 2x + 3\right) dx$

$= \left[-\frac{x^3}{3} + x^2 + 3x\right]_{2}^{3}$

$= \left[-\frac{(3)^3}{3} + (3)^2 + 3(3)\right] - \left[-\frac{(2)^3}{3} + (2)^2 + 3(2)\right]$

$= \frac{5}{3}$ **OR/*OF*** $\approx 1{,}67$ *units / eenh*^{2}

Area bounded by curve and *x*- axis/
oppervlakte begrens deur kromme en x-as

$= \frac{5}{3} + \frac{22}{3} + \frac{5}{3} = \frac{32}{3} \approx 10{,}67$ *units*^{2} */ eenh*^{2}

✓ $\frac{32}{3}$ or / *of* $10{,}67$ *units*^{2} */ eenh*^{2}

Area of /*opp.vlak. van* Δ OEC

$= \frac{1}{2} \times 2 \times 3$ **OR/*OF***

$= \int_{0}^{2} \left(-\frac{3}{2}x + 3\right) dx$

$= \left[-\frac{3}{4}x^2 + 3x\right]_{0}^{2}$

$= 3$ *units*^{2} */ eenh*^{2}

✓**M** **A**

✓ Area of/ *opp. vlak. van* Δ **A**

∴ Total shaded Area/ *Totale gearseerde oppervlakte*

$= \frac{32}{3} - 3 = \frac{23}{3}$ **OR/*OF*** $\approx 7{,}67$ *units*^{2} */ eenh*^{2}

✓ $\frac{23}{3} \approx 7{,}67$ *units*^{2} */ eenh*^{2} **CA**

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