basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS
SENIORSERTIFIKAAT-EKSAMEN/ NASIONALE SENIORSERTIFIKAAT-EKSAMEN

TECHNICAL MATHEMATICS P1/*TEGNIESE WISKUNDE V1*

MAY/JUNE/*MEI/JUNIE* 2024

FINAL/*FINALE* 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*

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

DATE APPROVED/DATUM GOEDGEKEUR	11 MAY 2024
EXTERNAL/*EKSTERNE* MODERATOR	INTERNAL /*INTERNE* MODERATORS
M.A. HENDRICKS	**N. TOM**
MA HENDRICKS External Moderator UMALUSI	**W. WHITE**

NOTE:

- If a candidate answers a question TWICE, mark only the FIRST attempt.
- Consistent accuracy applies in all aspects of the marking guidelines where indicated.
- # Shows questions where a Tolerance Range will be applied:
  Q 2.2 ; Q 5.2.1 ; Q 6.1 & Q 9.2

LET WEL:

- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.*
- *Volgehoue akkuraatheid is deurgaans op alle aspekte van die nasienriglyne soos aangedui.*
- *# Toon vrae waar Toleransie wydte (Verdraagsaamheids omvang) toegepas word:*
  V 2.2 ; V 5.2. ; V 6.1 & V 9.2

QUESTION/*VRAAG* 1

1.1.1	$x^2 - x - 12 = 0$ $(x-4)(x+3) = 0$ **OR/*OF*** $x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-12)}}{2(1)}$ $x = 4$ *or/of* $x = -3$	✓factors/formula *faktore/formule* ✓both values of x *beide waardes van x* **AO: Full Marks/*Volpunte***	**A** **CA** (2)
1.1.2	$x^2 - x - 12 \leq 0$ $(x-4)(x+3) \leq 0$ $-3 \leq x \leq 4$ **OR/OF** $x \in [-3\,;\,4]$	✓ correct notation *korrekte notasie* **ADDENDUM**	**CA** (1)
1.1.3	$x^2 - x - 12 = -5$ $x^2 - x - 7 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-7)}}{2(1)}$ $x \approx -2{,}19$ *or/of* $x \approx 3{,}19$	✓ standard form */standaardvorm* ✓ **SF** ✓ positive x-value *Positiewe x-waarde* ✓ negative value of x *negatiewe waarde v x* **NPR** **AO: Full Marks/*Volpunte***	**A** **CA** **CA** **CA** (4)

1.2.1	$2y-x=7$ $x=2y-7$	✓ x subject of formula *x onderwerp van formule*	**A** (1)
1.2.2	$x=2y-7$ $x^2+xy=21-y^2$ $(2y-7)^2+(2y-7)y=21-y^2$ $4y^2-28y+49+2y^2-7y=21-y^2$ $7y^2-35y+28=0$ **OR/*OF*** $y^2-5y+4=0$ $(y-4)(y-1)=0$ **OR/*OF*** $y=\frac{-(-5)\pm\sqrt{(-5)^2-4(1)(4)}}{2(1)}$ $y=4$ or/*of* $y=1$ $x=2(4)-7=1$ or/*of* $x=2(1)-7=-5$ **OR/*OF*** $2y-x=7$ $y=\frac{x}{2}+\frac{7}{2}$ $x^2+xy=21-y^2$ $x^2+x\left(\frac{x}{2}+\frac{7}{2}\right)=21-\left(\frac{x}{2}+\frac{7}{2}\right)^2$ $x^2+\frac{x^2}{2}+\frac{7x}{2}=21-\left(\frac{x^2}{4}+\frac{7x}{2}+\frac{49}{4}\right)$ $x^2+\frac{x^2}{2}+\frac{7x}{2}=21-\frac{x^2}{4}-\frac{7x}{2}-\frac{49}{4}$ $4x^2+2x^2+14x=84-x^2-14x-49$ $7x^2+28x-35=0$ **OR/*OF*** $x^2+4x-5=0$ $(x+5)(x-1)=0$ **OR/*OF*** $x=\frac{-(4)\pm\sqrt{(4)^2-4(1)(-5)}}{2(1)}$ $x=-5$ or/*of* $x=1$ $y=\frac{-5}{2}+\frac{7}{2}=1$ or/*of* $y=\frac{1}{2}+\frac{7}{2}=4$	✓ subst. */verv.* ✓ standard form */vorm* ✓ factors/formula *Faktor/formule* ✓ both y-values *beide y-waardes* ✓both x-values *beide x-waardes* **OR/*OF*** ✓ subst./*verv.* ✓ standard form */standaardvorm* ✓ factors/formula *faktore/formule* ✓ both x-values */beide x-waardes* ✓both y-values *beide y-waardes*	**CA** **CA** **CA** **CA** **CA** **A** **CA** **CA** **CA** **CA** (5)

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1.3.1	$T = \frac{12,5\,D}{D+4d}$ $T(D+4d) = 12,5\,D$ $(D+4d) = \frac{12,5\,D}{T}$ $d = \frac{\frac{12,5\,D}{T} - D}{4}$ **OR/*OF*** $d = \frac{12,5D}{4T} - \frac{D}{4}$ ***OR/OF*** $d = \frac{12,5D - DT}{4T}$	✓ multiplication/ *vermenigvuldiging* ✓ division/ *deling* ✓ subtraction and division/ *aftrekking en deling*	**A** **A** **CA** (3)
1.3.2	$d = \frac{\frac{12,5\,D}{T} - D}{4}$ $= \frac{\frac{12,5(32)}{(10)} - (32)}{4}$ $d = 2$ **OR/OF** $d = \frac{12,5D}{4T} - \frac{D}{4}$ $= \frac{12,5(32)}{4(10)} - \frac{32}{4}$ $d = 2$ **OR/OF** $d = \frac{12,5D - DT}{4T}$ $= \frac{12,5(32) - (32)(10)}{4(10)}$ $d = 2$ **OR/*OF*** $T = \frac{12,5\,D}{D+4d}$ $10 = \frac{12,5 \times 32}{32+4d}$ $d = 2$	✓ **SF** ✓ value of /*waarde van d* **OR/*OF*** ✓ **SF** ✓ value of /*waarde van d* **OR/OF** ✓ **SF** ✓ value of /*waarde van d* **OR/*OF*** ✓ **SF** ✓ value of /*waarde van d*	**CA** **CA** **CA** **CA** **CA** **A** **CA** (2)

1.4	111110_2 2^5 | 2^4 | 2^3 | 2^2 | 2^1 | 2^0 1 | 1 | 1 | 1 | 1 | 0 32 | 16 | 8 | 4 | 2 | 0 $32 + 16 + 8 + 4 + 2 = 62$ $\therefore\ 2\left(111110_2 + 38\right)$ $= 2\left(62 + 38\right)$ $= 200$	✓ 62 ✓ 200 **AO: Full Marks/*Volpunte***	**A** **CA** (2)
			[20]

QUESTION/*VRAAG* 2

2.1.1	$b = 0$	✓ Value of/ *waarde van b*	**A** (1)
2.1.2	$b = \frac{2}{5}$ *OR / OF* 0,4	✓ Value of/ *waarde van b*	**A** (1)
2.2 #	$kx^2 = 35 - 2x$ $kx^2 + 2x - 35 = 0$ $\Delta = b^2 - 4ac$ $= (2)^2 - 4(k)(-35)$ $= 4 + 140k$ For real roots / Vir reële wortels: $\Delta \geq 0$ $4 + 140k \geq 0$ $k \geq -\frac{1}{35}$ **OR/*OF*** $-0,03$	✓ standard form /*standaardvorm* ✓ **SF** ✓ **S** ✓ $\Delta \geq 0$ ✓ Values of /*waardes van k* **ADDENDUM**	**A** **CA** **CA** **A** **CA** (5)
			[7]

QUESTION/*VRAAG* 3

3.1.1	$\sqrt[3]{8x^{27}} = 2x^9$	✓ $2\ x^9$	**A** (1)
3.1.2	$9^{n+1} \times 4^n \times 6^{1-2n}$ $= (3^2)^{n+1} \times (2^2)^n \times (2\times 3)^{1-2n}$ $= 3^{2n+2} \times 2^{2n} \times 2^{1-2n} \times 3^{1-2n}$ $= 3^{2n+2+1-2n} \times 2^{2n+1-2n}$ $= 3^3 \times 2^1$ $= 54$	✓ prime bases */priem grondtalle* ✓ expansion/*uitbreiding* ✓ **S**	**A** **CA** **CA** (3)
3.1.3	$\sqrt{k}\ (2-\sqrt{k}) - \sqrt{4k}$ $= 2\sqrt{k} - k - 2\sqrt{k}$ $= -k$ **OR/*OF*** $\sqrt{k}\ (2-\sqrt{k}) - \sqrt{4k}$ $= k^{\frac{1}{2}}\left(2 - k^{\frac{1}{2}}\right) - 2k^{\frac{1}{2}}$ $= 2k^{\frac{1}{2}} - k - 2k^{\frac{1}{2}}$ $= -k$	✓ $2\sqrt{k} - k$ ✓ $-2\sqrt{k}$ ✓ **S** **OR/*OF*** ✓ $2k^{\frac{1}{2}} - k$ ✓ $-2k^{\frac{1}{2}}$ ✓ **S**	**A** **A** **CA** **A** **A** **CA** (3)
3.2.1	$\log 72 - \log 2$ **OR/*OF*** $\log 36 + \log 2 - \log 2 = \log 36$ $= \log \frac{72}{2}$ **OR/*OF*** $\log 36$ **OR/*OF*** $2 \log 6$	✓ log prop./*eienskap*	**A** (1)
3.2.2	$\frac{\log 72 - \log 2}{\log 6} = \frac{\log 36}{\log 6}$ $= \frac{\log 6^2}{\log 6}$ **OR/*OF*** $= \log_6 36$ $= \frac{2\log 6}{\log 6}$ $= 2\log_6 6$ $= 2$	**AO: Full Marks if Q 3.2.1 is correct otherwise only 1mark** ***/Volpunte indien V3.2.1 korrek is anders Slegs 1 punt*** ✓ log prop./*eienskap* ✓ **S** **ADDENDUM**	**CA** **CA** (2)

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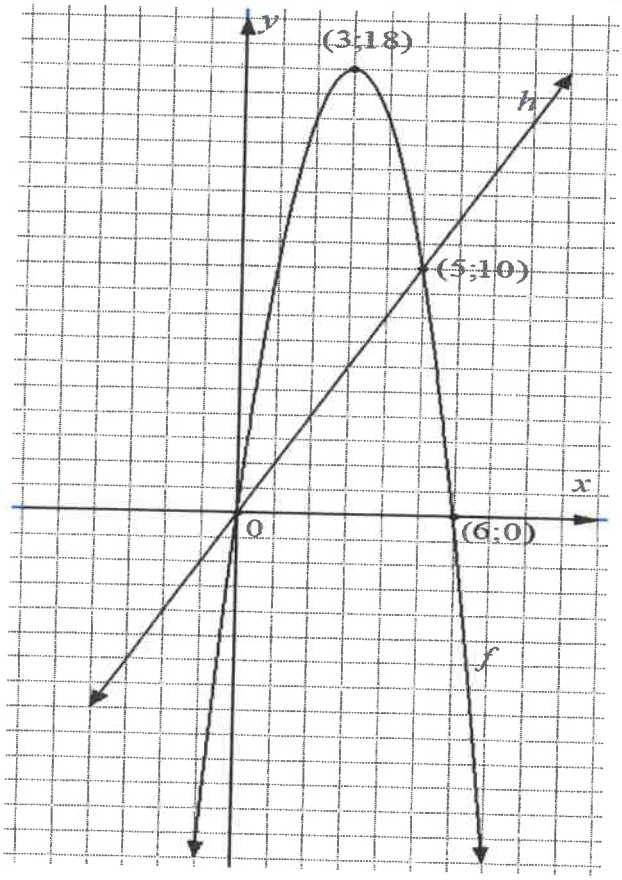
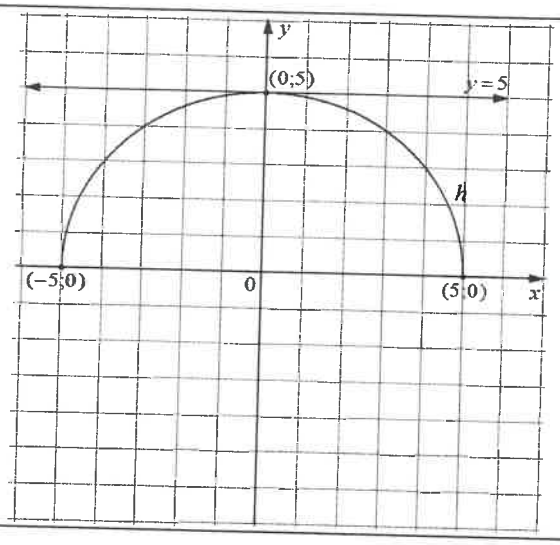
3.3	$5^{x+2} - 5^x = 600$ $5^x \cdot 5^2 - 5^x = 600$ $5^x(25-1) = 600$ $5^x = 25$ $5^x = 5^2$ **OR/*OF*** $x = \log_5 25$ **OR/*OF*** $\log 5^x = \log 5^2$ $x\log 5 = 2\log 5$ $\therefore x = 2$	✓separating exp./*skei eksp.* ✓ factors / *faktore* ✓ **S** ✓ exp or log. prop./eksp. *of log eienskap* ✓ value of /*waarde van x* **AO: Full Marks/*Volpunte***	**A** **CA** **CA** **CA** **CA** (5)
3.4.1	$-i$ **OR/*OF*** $0-i$	✓ conjugate /*gekojugeerde*	**A** (1)
3.4.2	$\frac{2+3i}{i}$ $= \frac{2+3i}{i} \times \frac{-i}{-i}$ $= \frac{-2i-3i^2}{-i^2}$ **OR / OF** $-\frac{2i}{-i^2}+3$ $= \frac{-2i-3(-1)}{-(-1)}$ **OR / OF** $-\frac{2i}{-(-1)}+3$ $= -2i+3$	✓ **M** ✓ **S** ✓ -1 ✓ **S** **ADDENDUM**	**A** **CA** **A** **CA** (4)
3.5	$a+bi = -i-14$ $\therefore a = -14$ and / *en* $b = -1$	✓ *a*-value/*waarde* ✓ *b*-value/*waarde*	**A** **A** (2)
			[22]

QUESTION/*VRAAG* 4

4.1.1	$(3;18)$	✓ 3 ✓ 18	**A** **A** (2)
4.1.2	$-2(x-3)^2+18=0$ $-2(x^2-6x+9)+18=0$ $-2(x^2-6x+9)+18=0$ $-2x^2+12x=0$ $-2x(x-6)=0$ **OR/*OF*** $x=\frac{-(12)\pm\sqrt{(12)^2-4(-2)(0)}}{2(-2)}$ $x=0$ or/*of* $x=6$ **OR/*OF*** $-2(x-3)^2+18=0$ $2(x-3)^2=18$ **OR/*OF*** $(x-3)^2=9$ $x-3=\pm 3$ $x=0$ or/*of* $x=6$	✓ = 0 ✓ Standard form *standaard vorm* ✓ factors/formula *faktore/formule* ✓ both values of x *albei waardes van* x **OR/*OF*** ✓ = 0 ✓ **S** ✓ **S** ✓ both x-values of /*albei x-waardes*	**A** **CA** **CA** **CA** **A** **CA** **CA** **CA** (4)
4.1.3 & 4.1.5		**4.1.3** *f*: ✓ Turning point *Draaipunt* ✓ both x- int beide *x-afsn.* ✓ shape/*vorm* **ADDENDUM** **4.1.5** *h* : ✓ x- int./*afsn.* & $(5;10)$ ✓ increasing line/ *toenemende lyn* **ADDENDUM**	**CA** **CA** **CA** (3) **CA** **CA** (2)

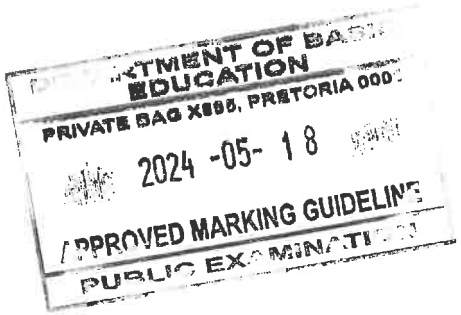
4.1.4 (a)	$f(x) = -2(x-3)^2 + 18$ subst./*verv.* $(5;t)$ $t = -2(5-3)^2 + 18$ $= 10$ **OR/*OF*** $f(x) = -2x^2 + 12x$ $t = -2(5)^2 + 12(5)$ $= 10$	✓ subst./*verv* ✓ value of /*waarde van* t **OR/*OF*** ✓ subst./*verv* ✓ value of /*waarde van* t **AO: Full Marks/*Volpunte***	**A** **CA** **CA** **CA** (2)
4.1.4 (b)	$h(x) = 2x + c$ subst./*verv* $(5;10)$ $10 = 2(5) + c$ $c = 0$	✓ subst./*verv* ✓ c-value of /*c-waarde*	**CA** **CA** (2)
4.1.5	REFER TO DIAGRAM IN Q 4.1.3		
4.2.1 (a)	$x \in \mathbb{R}$; $x \neq 0$ **OR/*OF*** $x \in (-\infty;0) \cup (0;\infty)$	✓ $x \neq 0$ **OR/*OF*** $x \in (-\infty;0) \cup (0;\infty)$	**A** (1)
4.2.1 (b)	$y > -4$ **OR/OF** $y \in (-4;\infty)$	✓ Range/*waarde versameling*	**A** (1)
4.2.1 (c)	$q = -4$	✓ $q = -4$	**A** (1)
4.2.1 (d)	$D(0;-3)$	✓ $x = 0$ ✓ $y = -3$	**A** **CA** (2)
4.2.2	$0 = -\frac{8}{x} - 4$ $4 = -\frac{8}{x}$ $4x = -8$ $x = -2$ $C(-2;0)$	✓ $y = 0$ ✓ **S** ✓ x-value /*x-waarde* **AO: Full Marks/*Volpunte***	**A** **CA** **CA** (3)
4.2.3	$g(x) = a^x + q$ $g(x) = a^x - 4$ $0 = a^{-2} - 4$ subst./verv. $(-2;0)$ $4 = a^{-2}$ $a = \frac{1}{2}$	✓ subst./*verv* ✓ a-value /*a-waarde*	**CA** **CA** (2)

4.3		*h*: ✓ shape/*vorm* ✓ *x*-intercepts / *afsnitte* ✓ line/*lyn* $y = 5$	A A CA (3)
			[28]

QUESTION/*VRAAG* 5

5.1.1	250	✓ 250	**A** (1)
5.1.2	$A = P(1+i)^n$ $= 250\ (1+50\%)^{12}$ $\approx 32\ 437$	✓**F** ✓**SF** ✓ **S** **ADDENDUM**	**A** **CA** **CA** (3)
5.1.3	$A = P(1+i)^n$ $100\ 000 = 250\ (1+50\%)^n$ $\frac{100\ 000}{250} = (1,5)^n$ $n = \frac{\log\left(\frac{100\,000}{250}\right)}{\log(1,5)}$ **OR/OF** $n = \log_{1,5}\frac{100\,000}{250}$ $\therefore n \approx 15$ months/ *maande*	✓**F** ✓ **SF** ✓ log form/*-vorm* ✓ value of/*waarde van n* **ADDENDUM**	**A** **CA** **CA** **CA** (4)
5.2.1 #	Value of investment end of 3 years/ *Waarde van belegging einde van 3 jaar*: $A = P(1+i)^n$ $= R15000\left(1+\frac{8,5\%}{4}\right)^{3\times 4}$ $\approx R19305,28$ Value of investment end of 5 years/ *Waarde van belegging einde van 5 jaar*: $A = P(1+i)^n$ $= R19305,28\left(1+\frac{6\%}{2}\right)^{2\times 2}$ $\approx R\,21\,728,26$ $\therefore$ R 21 728, 26 < R 23 000 He will **NOT** have enough money/*Hy sal **NIE** genoeg geld hê NIE.*	✓ values of *i* and *n*/ *waarde van i en n* ✓ **S** ✓ values of *i* and *n*/ *waarde van i en n* ✓ R 21 728,26 ✓conclusion/*gevolgtrekking*	**A** **CA** **A** **CA** **CA**

	OR/*OF* $A = P(1+i)^n$ $= R15000\left(1+\frac{8,5\%}{4}\right)^{3\times 4} \times \left(1+\frac{6\%}{2}\right)^{2\times 2}$ $\approx R\,21\,728,26$ $\therefore$ R 21 728, 26 < R 23 000 He will **NOT** have enough money/*Hy sal **NIE** genoeg geld hê NIE*	**OR/*OF*** ✓ **M** ✓ values of *i* and *n*/ *waarde van i en n* ✓ values of *i* and *n*/ *waarde van i en n* ✓ R 21 728,26 ✓conclusion/*gevolgtrekking*	**A** **A** **A** **CA** **CA** (5)
5.2.2	R 21 728, 26 – R 15 000 = R 6 728, 26	**ADDENDUM** ✓ **M** subtracting / *aftrek* ✓ interest earned *rente verdien*	**A** **CA** (2)
			[15]



QUESTION/*VRAAG* 6

6.1 #	$f(x) = 11 + 7x$ $f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$ $= \lim_{h\to 0} \frac{11+7(x+h)-(11+7x)}{h}$ $= \lim_{h\to 0} \frac{11+7x+7h-11-7x}{h}$ $= \lim_{h\to 0} \frac{7h}{h}$ $= \lim_{h\to 0} (7)$ $\therefore f'(x) = 7$	✓definition/*definisie* ✓ **SF** ✓ **S (only if the given expression is used)/** ***(slegs as die gegewe uitdrukking gebruik is.)*** ✓**S** ✓ 7 **Penalty: 1 mark for incorrect notation/** ***Penaliseer : 1 punt vir foutiwe notasie*** **AO : 1 mark/** ***punt*** **ADDENDUM**	**A** **A** **CA** **CA** **CA** (5)
6.2.1	$y = x^8$ $\therefore \frac{dy}{dx} = 8x^7$	✓ $8x^7$	**A** (1)
6.2.2	$f(x) = \sqrt[3]{x^4}$ $= x^{\frac{4}{3}}$ $\therefore f'(x) = \frac{4}{3}x^{\frac{1}{3}}$ **OR / OF** $f'(x) = \frac{4}{3}\sqrt[3]{x}$	✓ $x^{\frac{4}{3}}$ ✓ $\frac{4}{3}x^{\frac{1}{3}}$ **OR/ OF** $\frac{4}{3}\sqrt[3]{x}$	**A** **CA** (2)
6.2.3	$D_x\left[\frac{x^2-16}{4-x}\right]$ $= D_x\left[\frac{(x+4)(x-4)}{-(x-4)}\right]$ **OR/ OF** $= D_x\left[\frac{-(x+4)(4-x)}{(4-x)}\right]$ $= D_x[-x-4]$ $= -1$	✓✓ factors /*faktore* ✓ **S** ✓ -1	**A** **A** **CA** **CA** (4)

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6.3	$g(x) = -\frac{9}{x}$ $g(-3) = -\frac{9}{(-3)} = 3$ $g(-1) = -\frac{9}{(-1)} = 9$ *Av./Gemid. Gradient* $= \frac{g(x_2) - g(x_1)}{x_2 - x_1}$ $= \frac{3-9}{-3-(-1)}$ **OR/*OF*** $= \frac{9-3}{-1-(-3)}$ $= 3$	✓ both $g(x)$–values beide $g(x)$–waardes ✓ **F** ✓ 3	**A** **A** **CA** (3)
6.4.1	$f(x) = mx^3 + mx - 4$ $\therefore f'(x) = 3mx^2 + m + 0$	✓ $3mx^2$ ✓ $m + 0$ **OR/*OF*** $m - 0$	**A** **A** (2)
6.4.2	$f'(2) = 3m(2)^2 + m = 13m$	✓ 13 m	**CA** (1)
6.4.3	$f'(2) = 39$ $13m = 39$ $m = 3$	✓ Equating derivative to 39/ *Stel afgeleide gelyk aan 39* ✓ Value of / waarde van m	**CA** **CA** (2)
			[20]

QUESTION/*VRAAG* 7

7.1	$F(0\,;-2)$	✓ 0 ✓ −2	A A (2)
7.2	$2^3+p(2)^2+9(2)-2=0$ $8+4p+18-2=0$ **OR/OF** $4p=-24$ $p=-6$	✓ Subst./*verv.* $(2\,;0)$ ✓ **S**	A A (2)
7.3	x-intercepts/*afsnitte*; $y=0$ $(x-2)(x^2-4x+1)=0$ $\therefore\ x=2$ or/*of* $x=\dfrac{-(-4)\pm\sqrt{(-4)^2-4(1)(1)}}{2(1)}$ $\therefore x_B=2$ and/*en* $x_A=2-\sqrt{3}$ and/*en* $x_C=2+\sqrt{3}$ $\therefore$ BC $=\sqrt{3}$	✓ = 0 ✓ quadratic factor *kwadratiese faktor* ✓ **SF** ✓ values of/waardes van x ✓ length of / lengte van BC **AO:Full Marks/Volpunte** **ADDENDUM**	A A CA CA CA (5)
7.4	$h'(x)=3x^2-12x+9=0$ $3(x-1)(x-3)=0$ **OR/*OF*** $x=\dfrac{-(-12)\pm\sqrt{(-12)^2-4(3)(9)}}{2(3)}$ $\therefore x=1$ or/*of* $x=3$ $h(1)=(1)^3-6(1)^2+9(1)-2=2$ $h(3)=(3)^3-6(3)^2+9(3)-2=-2$ $\therefore$ D $(1\,;2)$ and/*en* E$(3\,;-2)$	✓derivative/*afgeleide* ✓ derivative = 0 *afgeleide* = 0 ✓factors/formula *faktore/formule* ✓both x-values *beide x-waardes* ✓ both y-values *beide y-waardes* **AO: Full Marks/*Volpunte*** **ADDENDUM**	A A CA CA CA (5)

7.5	$2 < x < 3$ or / *of* $x > 2+\sqrt{3}$ **OR/*OF*** $x \in (2;3)$ or / *of* $x \in (2+\sqrt{3};\ \infty)$ **OR/*OF*** $x > 2$ and /en $x < 3$ or / *of* $x > 2+\sqrt{3}$	✓ critical values *kritiese waardes* ✓ correct notation *korrekte notasie* ✓ $x > 2+\sqrt{3}$ **OR/*OF*** ✓ critical values *kritiese waardes* ✓ correct notation *korrekte notasie* ✓ $x \in (2+\sqrt{3};\ \infty)$ **OR/*OF*** ✓ critical values *kritiese waardes* ✓ correct notation *korrekte notasie* ✓ $x > 2+\sqrt{3}$	**CA** **A** **CA** **CA** **A** **CA** **CA** **A** **CA** **(3)**
			[17]

QUESTION/*VRAAG* 8

8.1	$h(0) = -(0)^2 + 6(0) + 1{,}62$ $= 1{,}62\,\text{m}$	✓ 1,62 m	**A** **NPU** (1)
8.2	$h'(t) = -2t + 6$	✓ $-2t + 6$	**A** (1)
8.3	$h'(t) = 0$ **OR/*OF*** $t = -\frac{b}{2a}$ $\therefore -2t + 6 = 0$ $t = -\frac{(6)}{2(-1)}$ $t = 3s$ $h(3) = -(3)^2 + 6(3) + 1{,}62$ $= 10{,}62$ m **OR/*OF*** $h = \frac{4ac - b^2}{4a}$ $h = \frac{4(-1)(1{,}62) - (6)^2}{4(-1)}$ $= 10{,}62$ m	✓ derivative/ *afgeleide* $= 0$ **OR/*OF*** using/ *gebruik* $-\frac{b}{2a}$ ✓ *t*-value / *waarde* ✓ Subst. *t*-value/*waarde* ✓ Maximum height/ *maks hoogte* **OR/*OF*** ✓ **F** ✓✓ subst/*verv. a,b* and/*en c* value/ *waarde* ✓ Maximum height/ *maks hoogte*	**A** **CA** **CA** **CA** **NPU** **A** **A** **A** **CA** **NPU** (4)
8.4	$-2t + 6 = 3$ $t = 1{,}5s$ $\therefore h(1{,}5) = -(1{,}5)^2 + 6(1{,}5) + 1{,}62$ $\approx 8{,}37\ m$ **OR/*OF*** $-2t + 6 = -3$ $t = 4{,}5s$ $\therefore h(4{,}5) = -(4{,}5)^2 + 6(4{,}5) + 1{,}62$ $\approx 8{,}37\ m$	✓ derivative / *afgeleide* $= 3$ ✓ *t*-value / *waarde* ✓ height / *hoogte* **OR/*OF*** ✓ derivative / *afgeleide* $= -3$ ✓ *t*-value / *waarde* ✓ height / *hoogte*	**CA** **CA** **CA** **NPU** **CA** **CA** **CA** **NPU** (3)
			[9]

MA HENDRICKS
External Moderator
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QUESTION/*VRAAG* 9

9.1.1	$\int x^4 dx$ $= \frac{x^5}{5} + C$	✓ $\frac{x^5}{5}$ ✓ C	**A** **A** (2)
9.1.2	$\int \left(2\pi + \frac{4}{x}\right) dx$ $= 2\pi x + 4\ln x + C$	✓ $2\pi x$ ✓ $4\ln x + C$ **No Penalty if C omitted/** ***Geen penalisering indien* C *weggelaat***	**A** **A** (2)
9.1.3	$\int (2x^{-3})^3 dx$ $\int 8x^{-9} dx$ $= -x^{-8} + C$ **OR/*OF*** $= -\frac{1}{x^8} + C$	✓ $8x^{-9}$ ✓ $-x^{-8} + C$ **No Penalty if C omitted/** ***Geen penalisering indien* C *weggelaat***	**A** **CA** (2)
9.2 #	$A = \int_{-1}^{3} g(x)\, dx$ $= \int_{-1}^{3} (2^x + 2)\, dx$ $= \left[\frac{2^x}{\ln 2} + 2x\right]_{-1}^{3}$ $= \left[\frac{(2)^3}{\ln 2} + 2(3)\right] - \left[\frac{(2)^{-1}}{\ln 2} + 2(-1)\right]$ $\approx 18{,}82$ *units*^{2} / *eenhede*^{2} **OR/*OF*** $= 8 + \frac{15}{2\ln 2}$ *units*^{2} / *eenhede*^{2}	✓Area notation using integrals/ *Oppervlak-notasie met gebruik van integrale* ✓ $\frac{2^x}{\ln 2}$ ✓ $+ 2x$ ✓✓ **SF** ✓ area /*oppervl* **AO: 1 mark/ *1 punt*** **NPU** **No substitution or simplification marks to be allocated if there is no integration/ *Geen vervangings- of vereenvoudigingspunte moet toegeken word as daar geen integrasie is nie.*** **ADDENDUM**	**M** **A** **A** **CA** **CA** (6)
			[12]

TOTAL/*TOTAAL*: 150