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

GRADE/GRAAD 12

TECHNICAL MATHEMATICS P1/*TEGNIESE WISKUNDE V1*

2022

FINAL 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 Penaliseering vir Eenhede Weggelaat nie*
S	Simplification/*Vereenvoudiging*
SF	Substitution in Correct Formula/*Vervanging in Korrekte Formule*
AO	Answer only/ *Slegs antwoord*

These marking guidelines consist of 21 pages.
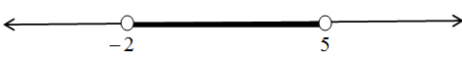*Hierdie nasienriglyne bestaan uit 21 bladsye.*

NOTE:
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent accuracy applies to all aspects of the marking guidelines where indicated.
- If a candidate strikes off a response to a question and does not attempt the question again, then the struck off question should be marked.

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 van toepassing.*
- *Indien 'n kandidaat 'n antwoord deurhaal en nie poog om die vraag weer te beantwoord dan moet die deurgehaalde antwoord gemerk word.*

QUESTION/*VRAAG* 1

1.1.1	$x^2 - 3x - 10 = 0$ $(x-5)(x+2) = 0$ **OR/*OF*** $\quad x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-10)}}{2(1)}$ $x = -2$ or/*of* $x = 5$	✓factors/ *faktore* or/*of* **SF** **A** ✓ both values /*beide waardes van x* **CA** (2)
1.1.2	$x^2 - 3x - 10 < 0$ $(x-5)(x+2) < 0$ $-2 < x < 5$ **OR/*OF*** $x \in (-2;5)$ $\qquad$ **OR/*OF*** $\quad x > -2$ and/*en* $x < 5$ **Note: If correct number line representation is shown and where no other calculations are shown then Award full marks.** *Nota: Indien slegs die korrekte getallelyn en geen ander berekeninge vertoon word kan volpunte toegeken word.*	✓ critical values/*kritiese waardes* **CA** ✓ correct notation/*korrekte notasie* **A** ✓ number line representation/ *Getallelyn voorstelling* **CA** (3)
1.2	$2x^2 - 11 = -7x$ $2x^2 + 7x - 11 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-7 \pm \sqrt{7^2 - 4(2)(-11)}}{2(2)}$ $x = -4,68$ or/*of* $x = 1,18$	✓ standard form/*standaardvorm* **A** ✓ **SF** **CA** ✓ both values of *x* correctly rounded/ *beide waardes van x korrek afgerond* **CA**

OR/*OF*

$$0 = -2x^2 - 7x + 11$$

$$\therefore x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(-2)(11)}}{2(-2)}$$

$$\therefore x = -4{,}68 \quad \text{or/}of \quad x = 1{,}18$$

| **Penalty for Rounding/ *Penalisering vir Afronding*** |

OR/*OF*

✓ standard form/*standaardvorm* **A**

✓ **SF** **CA**

✓ both values of *x* correctly rounded/ *beide waardes van x korrek afgerond* **CA**

(3)

1.3

$$y - x + 1 = 0 \quad ....1$$
$$y + 7 = x^2 + 2x \quad ....2$$
$$y = x - 1$$
$$(x - 1) + 7 = x^2 + 2x$$
$$\therefore x^2 + x - 6 = 0$$

$$(x + 3)(x - 2) = 0 \text{ OR/}OF \quad x = \frac{-(1) \pm \sqrt{(1)^2 - 4(1)(-6)}}{2(1)}$$

$$x = -3 \quad \text{or/}of \quad x = 2$$
$$y = -3 - 1 \quad \text{or/}of \quad y = 2 - 1$$
$$y = -4 \quad \text{or/}of \quad y = 1$$

✓ *y* subject of formula/*onderwerp van formule* **A**
✓ *substitution/vervanging* **CA**
✓ *standard form/standaardvorm* **CA**

✓ *factors/ faktore or/of* **SF** **CA**

✓ *both/beide x-values/-waardes* **CA**

✓ *both/ beide y-values/-waardes* **CA**

OR/*OF*

OR/OF

$$x = y + 1$$
$$y + 7 = (y + 1)^2 + 2(y + 1)$$
$$y + 7 = y^2 + 2y + 1 + 2y + 2$$
$$y^2 + 3y - 4 = 0$$
$$(y + 4)(y - 1) = 0 \quad \text{or/}of \quad y = \frac{-(3) \pm \sqrt{(3)^2 - 4(1)(-4)}}{2(1)}$$
$$\therefore y = -4 \quad \text{or/}of \quad y = 1$$
$$x = -4 + 1 \quad \text{or/}of \quad x = 1 + 1$$
$$\therefore x = -3 \quad \text{or/}of \quad x = 2$$

✓ *x subject of formula/onderwerp van formule* **A**
✓ *substitution/vervanging* **CA**

✓ *correct standard form/korrekte standaardvorm* **CA**

✓ *factors/ faktore or/of* **SF** **CA**

✓ *both/ beide y-values/-waardes* **CA**
✓ *both/ beide x-values/-waardes* **CA**

(6)

1.4.1	$\dfrac{1}{R_P} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$		
	$\dfrac{1}{R_P} = \dfrac{R_1 + R_2}{R_1 . R_2}$	✓ simplification/*vereenvoudiging*	**A**
	$R_P = \dfrac{R_1 . R_2}{R_2 + R_1}$	✓ subject/*onderwerp*	**CA**
	OR/*OF*	**OR/*OF***	
	$\dfrac{1}{R_P} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$		
	$R_P\left(\dfrac{1}{R_P}\right) = R_P\left(\dfrac{1}{R_1} + \dfrac{1}{R_2}\right)$	✓ simplification/*vereenvoudiging*	**A**
	$R_P = \dfrac{1}{\dfrac{1}{R_1} + \dfrac{1}{R_2}}$	✓ subject/*onderwerp*	**CA**
		AO: full marks/*volpunte*	
			(2)
1.4.2	$R_P = \dfrac{40 \times 45}{45 + 40} = \dfrac{1800}{85}$	✓ **SF**	**CA**
	$R_P = \dfrac{360}{17}\,\Omega$ **OR/*OF*** $21{,}18\,\Omega$	✓ value of/*waarde van* R_P	**CA**
	OR/*OF*	**OR/*OF***	
	$\dfrac{1}{R_P} = \dfrac{1}{40} + \dfrac{1}{45} = \dfrac{17}{360}$	✓ **SF**	**A**
	$R_P = \dfrac{360}{17}\,\Omega$ **OR/*OF*** $21{,}18\,\Omega$	✓ value of/*waarde van* R_P	**CA**
	OR/*OF*	**OR/*OF***	
	$R_P = \dfrac{1}{\dfrac{1}{40} + \dfrac{1}{45}}$	✓ **SF**	**CA**
	$R_P = \dfrac{360}{17}\,\Omega$ **OR/*OF*** $21{,}18\,\Omega$	✓ value of/*waarde van* R_P	**CA**
		AO: full marks/*volpunte*	
			(2)

1.5	$1101100_2 \div 1100_2 = 1001_2$		

2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	1	0	1	1	0	0
			1	1	0	0

✓ **M**   **A**

$64 + 32 + 8 + 4 = 108$

$8 + 4 = 12$

$\therefore \ 108 \div 12 = 9$

$9 = 1001_2$

✓ 1001_2 **CA**

OR/*OF*   **OR/*OF***

$$\begin{array}{r} 1001 \\ 1100 \overline{)1101100} \\ \underline{1100} \\ 11 \\ \underline{0} \\ 110 \\ \underline{0} \\ 1100 \\ \underline{1100} \end{array}$$

✓ **M**   **A**

$1101100_2 \div 1100_2 = 1001_2$

✓ 1001_2 **CA**

AO: full marks/*volpunte*   (2)

[20]

QUESTION/*VRAAG* 2

2.1.1	$e = 4$	✓ Value of/*Waarde van e*	**A**
			(1)
2.1.2	$e < 4$	✓ Value of/*Waarde van e*	**A**
			(1)
2.2	$mx^2 - 12x + 9 = 0$ $\Delta = b^2 - 4ac$ $\Delta = (-12)^2 - 4(m)(9)$ $\Delta = 144 - 36m$ For equal roots /*Vir gelyke wortels*: $\Delta = 0$ $144 - 36m = 0$ $m = 4$	✓ **SF** ✓ **S** ✓ $\Delta = 0$ ✓ Value of/*Waarde van m*	**A** **CA** **A** **CA** (4) **[6]**

QUESTION/*VRAAG* 3
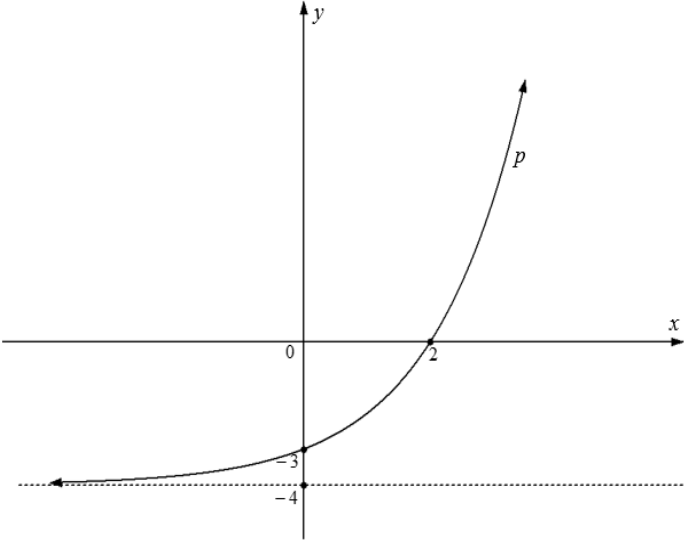
3.1.1	$\dfrac{3^x \times 3^{x-2}}{9^{x-3}}$		
	$= \dfrac{3^x \times 3^{x-2}}{3^{2x-6}}$	✓ prime base/*priembasis* 3^2	**A**
	$= 3^{x+x-2-2x+6}$	✓ exponent properties/*eksponent- eienskap*	**CA**
	$= 3^4 = 81$	✓ 3^4 or/*of* 81	**CA**
	OR/*OF*	**OR/*OF***	
	$\dfrac{3^x \times 3^{x-2}}{9^{x-3}}$		
	$= \dfrac{3^x \times 3^{x-2}}{3^{x-3} \times 3^{x-3}}$	✓ prime base/*priembasis*	**A**
	$= 3^{x+x-2-x+3-x+3}$	✓ exponent properties/*eksponent- eienskap*	**CA**
	$= 3^4 = 81$	✓ 3^4 or/*of* 81	**CA**
	OR/*OF*	**OR/*OF***	
	$\dfrac{3^x \times 3^{x-2}}{9^{x-3}}$		
	$= \dfrac{3^x \times 3^x \times 3^{-2}}{9^x \times 9^{-3}}$	✓ Split powers /*Verdeel magte*	**A**
	$= \dfrac{9^x \times 9^{-1}}{9^x \times 9^{-3}}$	✓ exponent properties/*eksponent- eienskap*	**CA**
	$= 9^2 = 81$	✓ 9^2 or/*of* 81	**CA**
			(3)
3.1.2	$\left(\sqrt{5}+4\right)^2 - \sqrt{45}$		
	$= 5 + 8\sqrt{5} + 16 - 3\sqrt{5}$	✓ squaring binomial/*kwadreer binoom*	**A**
	$= 21 + 5\sqrt{5}$	✓ $3\sqrt{5}$	**A**
		✓ $21 + 5\sqrt{5}$	**CA**
			(3)

3.1.3	$\log_{32} 8 + \log 10$	
	$= \dfrac{\log 8}{\log 32} + 1$	✓ change of base law/*verandering van basis wet* **A**
	$= \dfrac{\log 2^3}{\log 2^5} + 1$	✓ 1 **A**
	$= \dfrac{3\log 2}{5\log 2} + 1$	✓ log property/*-eienskap* **A**
	$= \dfrac{3}{5} + 1$	
	$= \dfrac{8}{5} = 1{,}6$	✓ $\dfrac{8}{5}$ or/*of* $1{,}6$ **CA**
		AO: zero marks/*punte*
		(4)
3.2	$\log_4 x + \log_4 (x-6) = \log_5 25$	✓ $\log_4 x(x-6)$ **A**
	$\log_4 x(x-6) = \log_5 5^2$	✓ 2 **A**
	$\log_4 (x^2 - 6x) = 2$	✓ log definition/prop./ *-definisie/-eiensk.* **CA**
	$x^2 - 6x = 4^2$ **OR / OF** $\log_4 (x^2 - 6x) = \log_4 4^2$	✓ factors/ *faktore* or/*of* **SF** **CA**
	$x^2 - 6x - 16 = 0$	✓ $x = 8$ **CA**
	$(x-8)(x+2) = 0$ **OR**/**OF** $x = \dfrac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(-16)}}{2(1)}$	✓ $x \neq -2$ **CA**
	$x = 8 \; or/of \; x \neq -2$	(6)
	$\therefore \; x = 8$	
3.3.1	$z_1 = 4\sqrt{2} \, cis\,(225°)$	
	$= 4\sqrt{2} \cos 225° + 4\sqrt{2} \sin 225° . i$	✓ polar expansion/*polêre uitbrei* **A**
	$= -4 - 4i$	✓ $-4 - 4i$ **CA**
		AO: full marks/*volpunte*
		(2)
3.3.2	$z_1 + z_2$	
	$= (-4 - 4i) + (3 - 4i)$	✓ Substitution/*Vervanging* **CA**
	$= -4 - 4i + 3 - 4i$	
	$= -1 - 8i$	✓ $-1 - 8i$ **CA**
		(2)

| 3.4 | $-p+qi = 4i^5 - 2(7+3i)$
 $-p+qi = 4(i^2)^2 i - 14 - 6i$
 $-p+qi = 4(-1)^2 i - 14 - 6i$
 $-p+qi = 4i - 14 - 6i$
 $-p+qi = -14 - 2i$
 $\therefore p = 14$ and/*en* $q = -2$ | ✓ rewriting/*herskryf* i^5 as $(i^2)^2 i$ **A**

 ✓ replacing/*vervang* i^2 with/*met* -1 **A**
 ✓ **S**   **CA**

 ✓ p value/*-waarde*   **CA**
 ✓ q value/*-waarde*   **CA**
 (5)
 [25] |

QUESTION/*VRAAG* 4

4.1.1	$f(x) = \dfrac{a}{x} + 2$ $4 = \dfrac{a}{-2} + 2$ $\dfrac{a}{2} = -2$ $a = -4$ $\therefore f(x) = -\dfrac{4}{x} + 2$	✓ substituting/*vervang.* 2 **A** ✓ subt./*verv.* $(-2;4)$ **A** ✓ value of/*waarde van a* **CA** (3)
4.1.2	$g(x) = x + 2$	✓ equation/*vergelyking* **A** (1)
4.1.3	$y \in \mathbb{R} \quad , y \neq 2$ **OR/*OF*** $y \in (-\infty; 2) \cup (2\,;\,\infty)$ **OR/*OF*** $y > 2$ or/*of* $y < 2$	✓ critical value/*kritiese waarde* **A** ✓ notation/*notasie* **A** **OR/*OF*** ✓ critical value/*kritiese waarde* **A** ✓ notation/*notasie* **A** **OR/*OF*** ✓ critical value/*kritiese waarde* **A** ✓ notation/*notasie* **A** (2)
4.1.4	$f(x) = -\dfrac{4}{x} + 2$ $0 = -\dfrac{4}{x} + 2$ $\dfrac{4}{x} = 2$ $2x = 4$ $x = 2$ **OR/*OF*** $\mathrm{W}(2\,;\,0)$	✓ $0 = -\dfrac{4}{x} + 2$ **A** ✓ *x*-coordinate of/*koördinaat van* W **CA** **OR/*OF*** ✓ *x*-coordinate /*koördinaat* **A** ✓ *y*-coordinate /*koördinaat* **A** (2)

4.1.5	$g(x) = 2 + 2 = 4$ $\therefore$ V(2 ; 4) **OR/OF** $\therefore$ V(2 ; 4)	✓ substitution of x-value of W **CA** ✓ coordinates of/*koördinate van* V **CA** **OR/OF** ✓ x-coordinate /*koördinaat* **A** ✓ y-coordinate /*koördinaat* **A** (2)
4.2.1	$y = -4$	✓ equation/*vergelyking* **A** (1)
4.2.2	$p(x) = 2^x - 4$ y-intercept/-*afsnit*; $x = 0$ $p(0) = 2^0 - 4$ $\therefore y = -3$ x- intercept/-*afsnit*; $y = 0$ $0 = 2^x - 4$ $2^x = 4$ $2^x = 2^2$ **OR/OF** $\therefore x = \log_2 4$ $\therefore x = 2$ $\therefore x = 2$	✓ $y = -3$ **A** ✓ $2^x = 2^2$ or/*of* $x = \log_2 4$ **A** ✓ $x = 2$ **CA** **AO:** full marks/*volpunte* (3)
4.2.3		✓ shape/*vorm* **A** ✓ both intercepts/beide *afsnitte* **CA** ✓ asymptote/*asimptoot* **CA** (3)
4.3.1	$k = (4)^2 - 2(4) + 4$ $\therefore k = 12$	✓ substitution/*vervanging* **A** ✓ value of/*waarde van* k **CA** **AO:** full marks/*volpunte* (2)

| 4.3.2 | $g(x) = x + 1$
 $C(4; y)$
 $y_C = 4 + 1 = 5$

 OR / OF $AC = \sqrt{(x_2 - x_1)^2 - (y_2 - y_1)^2}$
 $AC = y_A - y_C$

 $\quad = 12 - 5 \qquad\qquad = \sqrt{(4-4)^2 + (5-12)^2}$

 $\quad = 7 \text{ units/}eenhede \quad = 7 \text{ units/}eenhede$

 OR/OF

 $AC = (x^2 - 2x + 4) - (x+1)$
 $\quad = x^2 - 3x + 3$
 $\quad = (4)^2 - 3(4) + 3$
 $\quad = 7 \text{ units/}eenhede$ | ✓ y_C value/-*waarde*   **A**

 ✓ **M**   **A**
 ✓ length of/*lengte van* AC   **CA**

 OR/OF

 ✓ **M**   **A**

 ✓ substitution/*vervanging*   **CA**
 ✓ length of/*lengte van* AC   **CA**
 (3) |
| 4.3.3 | $f(x) = x^2 - 2x + 4$

 $x = -\dfrac{b}{2a}$ **OR/OF** $f'(x) = 0$

 $x = -\dfrac{(-2)}{2(1)}$ $2x - 2 = 0$

 $x = 1$ $x = 1$

 $\therefore = \dfrac{x_P + 4}{2} = 1$

 $\therefore x_P = -2$
 $f(-2) = (-2)^2 - 2(-2) + 4 = 12$
 $\therefore P(-2; 12)$

 OR/OF

 $f(x) = x^2 - 2x + 4$
 $P(x; 12)$
 $12 = x^2 - 2x + 4$
 $x^2 - 2x - 8 = 0$
 $(x-4)(x+2) = 0$ **OR / OF** $x = \dfrac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-8)}}{2(1)}$
 $\therefore x = 4 \text{ or/}of \ x = -2$
 $\therefore P(-2; 12)$ |

 ✓ **SF** or/of $2x - 2 = 0$ **A**

 ✓ value of /*waarde van* x **CA**

 ✓ value of/ *waarde van* x_P **CA**

 ✓ coordinate/*koördinaat*   **CA**

 OR/OF

 ✓ equating/*gelykstelling*   **CA**
 ✓ standard form/*standaardvorm*
                      CA
 ✓ factors/ *faktore* or/*of* **SF**   **CA**

 ✓ $x = -2$ **CA**
 (4)
 [26] |

QUESTION/*VRAAG* 5

> **Note: in Q5 the use of wrong formula must be regarded as a breakdown**
> *Nota*: *in V5 moet die gebruik van verkeerde formule as 'n afbreek*

5.1	$A = P(1+in)$ $A = R15350\left(1+\dfrac{21}{100}\times 2\right)$ $A = R21\,797$ Monthly payment/ *Maandelikse paaiement* $=\dfrac{R21797}{24}=R908,21$ **OR/*OF*** $SI = P\times i\times n$ $SI = 15350\times 21\% \times 2 = R\,6\,447$ $\therefore A = 15350 + 6\,447 = R\,21797$ Monthly payment/ *Maandelikse paaiement* $=\dfrac{R21797}{24}=R908,21$	✓ **SF** **A** ✓ value of/*waarde van* A **CA** ✓**M** divide by/*deel deur* 24 **CA** ✓monthly payment/*maandelikse paaiement* **CA** **OR/*OF*** ✓ **SF** **A** ✓ value of/*waarde van* A **CA** ✓**M** divide by/*deel deur* 24 **CA** ✓monthly payment/*maandelikse paaiement* **CA** **NPR** (4)
5.2.1	$500 \times 1,25 = 625$	✓ value/*waarde* **A** (1)
5.2.2	$A = P(1+i)^n$ $= 500(1+0,25)^{10}$ $= 4656,61$ ≈ 4656	✓ **F** **A** ✓ **SF** **A** ✓ value of/*waarde van* **CA** (3)

5.3

$$A = P(1+i)^n$$

$$50962,58 = P\left(1+\frac{6,78\%}{12}\right)^{24}\left(1+\frac{5,20\%}{4}\right)^{6}$$

$$P = \frac{50962,58}{\left(1+\dfrac{6.78\%}{12}\right)^{24}\left(1+\dfrac{5,20\%}{4}\right)^{6}}$$

$$\approx R41197,43$$

✓24   **A**

✓$\left(1+\dfrac{6,78\%}{12}\right)$ **A**

✓6   **A**

✓$\left(1+\dfrac{5,20\%}{4}\right)$ **A**

✓P the subject/*die onderwerp*   **CA**
✓value/*waarde*   **CA**

OR/*OF*　　　　　　　　　　　　　　　　　　　**OR/*OF***

$$A = P\left(1 + i\right)^n$$

$$A_2 = P\left(1 + \frac{6,78\%}{12}\right)^{24}$$

$$= (1,144.....)P$$

$$A_{3,5} = 1,145P\left(1 + \frac{5,20\%}{4}\right)^6$$

$$50\,962,58 = 1,237P$$

$$\frac{50\,962,58}{1,237} = P$$

$$P \approx R\,41\,197,43$$

✓24	**A**
✓ 1,145P	**CA**
✓6	**A**
✓1,237P	**CA**
✓P the subject/*die onderwerp*	**CA**
✓ value/*waarde*	**CA**

OR/*OF*　　　　　　　　　　　　　　　　　　　**OR/*OF***

$$P_1 = \frac{50\,962,58}{\left(1 + \frac{5,20\%}{4}\right)^6}$$

$$= R\,47\,162,27$$

$$\therefore P_2 = \frac{47\,162,27}{\left(1 + \frac{6,78\%}{12}\right)^{24}}$$

$$\approx R\,41\,197,43$$

✓6	**A**
✓$\left(1 + \frac{5,20\%}{4}\right)$	**A**
✓ R 47 162, 27	**CA**
✓24	**A**
✓$\left(1 + \frac{6,78\%}{12}\right)$	**A**
✓value/*waarde*	**CA**

NPR
(6)

[14]

QUESTION/*VRAAG* 6

6.1	$f(x) = 5 + x$ $f'(x) = \lim_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$ $= \lim_{h \to 0} \dfrac{5 + x + h - (5 + x)}{h}$ $= \lim_{h \to 0} \dfrac{5 + x + h - 5 - x}{h}$ $= \lim_{h \to 0} \dfrac{h}{h}$ $= \lim_{h \to 0} (1)$ $\therefore f'(x) = 1$	✓definition/*definisie* **A** ✓ Substitution/*Verv.* **CA** ✓ S **CA** **Penalty of one mark for incorrect notation** *Penaliseer een punt indien notasie foutief is.* ✓ S **CA** ✓1 **CA** **AO:** zero marks/*punte* (5)
6.2.1	$y = x(x+9)$ $= x^2 + 9x$ $\dfrac{dy}{dx} = 2x + 9$	✓ expansion/*ontwikkeling* **A** ✓ $2x$ **CA** ✓ 9 **CA** (3)
6.2.2	$D_x\left[\sqrt[7]{x} + \pi p^3\right]$ $= D_x\left[x^{\frac{1}{7}} + \pi p^3\right]$ $= \dfrac{1}{7}x^{-\frac{6}{7}}$	✓ $x^{\frac{1}{7}}$ **A** ✓✓ $\dfrac{1}{7}x^{-\frac{6}{7}}$ **CA** (3)
6.2.3	$f(x) = \dfrac{1 - x^9}{x^2}$ $= x^{-2} - x^7$ $f'(x) = -2x^{-3} - 7x^6$	✓ x^{-2} **A** ✓ $-x^7$ **A** ✓ $-2x^{-3}$ **CA** ✓ $-7x^6$ **CA** (4)
6.3.1	$g(x) = -4x^2$ $g(2) = -4(2)^2 = -16$	✓ -16 **A** (1)

| 6.3.2 | $g^{/}(x) = -8x$
 $m = g^{/}(2) = -8(2)$
 $m = -16$
 $y + 16 = -16(x-2)$ **OR/OF** $-16 = -16(2) + c$
 $\therefore c = 16$
 $\therefore y = -16x + 16$ | ✓ derivative/*afgeleide*

 ✓ gradient/*gradiënt*
 ✓ substitution/*verv.*

 ✓ equation/*verg.* | **A**

 CA
 CA

 CA
 (4) |
| | | | **[20]** |

QUESTION/*VRAAG* 7

7.1	C(3 ; 0)	✓3 **A** ✓ 0 **A** (2)
7.2	$h(x) = 2x + p$ subst. point/*verv. punt* C $0 = 2(3) + p$ $0 = 6 + p$ $\therefore\ p = -6$ **OR/*OF*** $g(x) = -(x + 2)(x - 1)(x - 3)$ *y*-int./*afsn.; x* = 0 $g(0) = -(0 + 2)(0 - 1)(0 - 3) = -6$ D(0 ; − 6) $\therefore\ p = -6$	✓ value/ *waarde p* **A** **OR/*OF*** ✓ value/ *waarde p* **A** **AO:** full marks/*volpunte* (1)
7.3	$g(x) = -(x + 2)(x - 1)(x - 3)$ A(-2;0) AC $= 2 + 3$ **OR / OF** AC $= \sqrt{(3+2)^2 + (0-0)^2}$ $= 5$ units/*eenhede* $= 5$ units/*eenhede*	✓ **M** **A** ✓ length of/*lengte van* AC **CA** **AO:** full marks/*volpunte* (2)
7.4	$g(x) = -(x + 2)(x - 1)(x - 3)$ $g(x) = -(x + 2)(x^2 - 4x + 3)$ $g(x) = -x^3 + 2x^2 + 5x - 6$ **OR/*OF*** $g(x) = -(x + 2)(x - 1)(x - 3)$ $g(x) = -(x - 1)(x^2 - x - 6)$ $g(x) = -x^3 + 2x^2 + 5x - 6$ **OR/*OF*** $g(x) = -(x + 2)(x - 1)(x - 3)$ $g(x) = -(x - 3)(x^2 + x - 2)$ $g(x) = -x^3 + 2x^2 + 5x - 6$	✓ quadratic bracket/*kwadratiese hakie* **A** ✓cubic form/*derdegraadse vorm* **CA** ✓ quadratic bracket/*kwadratiese hakie* **A** ✓cubic form/*derdegraadse vorm* **CA** ✓ quadratic bracket/*kwadratiese hakie* **A** ✓cubic form/*derdegraadse vorm* **CA** (2)

7.5	$g(x) = -x^3 + 2x^2 + 5x - 6$ $g'(x) = -3x^2 + 4x + 5$ $-3x^2 + 4x + 5 = 0$ $x = \dfrac{-4 \pm \sqrt{(4)^2 - 4(-3)(5)}}{2(-3)}$ $x = 2,12$ or/*of* $x = -0,79$ $g(2,12) = -(2,12)^3 + 2(2,12)^2 + 5(2,12) - 6$ $\qquad = 4,06$ $g(-0,79) = -(-0,79)^3 + 2(-0,79)^2 + 5(-0,79) - 6$ $\qquad = -8,21$ E$(-0,79 ; -8,21)$ and/*en* F$(2,12 ; 4,06)$	✓derivative/*afgeleide* ✓equating derivative to 0/ *stel afgeleide gelyk aan 0* ✓**SF** ✓both values of/*beide waardes* *van x* ✓ both values of /*beide waardes* *van y*	**CA** **A** **CA** **CA** **CA** **NPR** (5)
7.6	$x < -2$ or/*of* $1 < x < 3$ **OR/*OF*** $x \in (-\infty ; -2)$ or/*of* $x \in (1 ; 3)$ **OR/*OF*** $x < -2$ or/*of* $x > 1$ and/*en* $x < 3$	✓ $x < -2$ ✓ critical values/*kritiese waardes* ✓ correct notation/*korrekte notasie* **OR/*OF*** ✓ $x \in (-\infty ; -2)$ ✓ critical values/*kritiese waardes* ✓ notation/*notasie* **OR/*OF*** ✓ $x < -2$ ✓ critical values/*kritiese waardes* ✓ correct notation/*korrekte notasie*	**CA** **CA** **A** **CA** **CA** **A** **CA** **CA** **A** (3) **[15]**

QUESTION/*VRAAG* 8

8.1	$h(t) = -5t^2 + 25t$ $h(1) = -5(1)^2 + 25(1)$ $\qquad = 20\,\text{m}$	✓ substitution/*verv.* **A** ✓ height/*hoogte* **CA** **NPU** **(2)**
8.2	$h'(t) = -10t + 25$ $h'(0) = -10(0) + 25$ $\qquad = 25\,\text{m/s}$	✓ $-10t + 25$ **A** ✓ substituting/*verv.* 0 **CA** ✓ initial velocity/*aanvangsnelheid* **CA** **NPU** **(3)**
8.3	$-10t + 25 = 0$ $10t = 25$ **OR/*OF*** $t = -\dfrac{b}{2a} = -\dfrac{(25)}{2(-5)}$ $t = \dfrac{5}{2} = 2{,}5\,\text{s}$ $t = = 2{,}5\,\text{s}$ $h(2{,}5) = -5(2{,}5)^2 + 25(2{,}5)$ $\qquad\quad = 31{,}25\,\text{m}$ **OR/*OF*** $h = \dfrac{4ac - b^2}{4a}$ $h = \dfrac{4(-5)(0) - (25)^2}{4(-5)}$ $h = 31{,}25\,\text{m}$	✓ $h'(t) = 0$ or/*of* **SF** **A** ✓ value of/*waarde van* t **CA** ✓ max. height/*maks. hoogte* **CA** **OR/*OF*** ✓ **F** **A** ✓ **SF** **A** ✓ max. height/*maks. hoogte* **CA** **NPU** ┌─────────────────────────┐ **Note: The 3$^{\text{rd}}$ mark (CA) should not be awarded if the *t*-value is not calculated using optimisation.** *Nota: Die 3depunt (CA) moet nie toegeken word indien die waarde van t nie vanuit optimalisering.* └─────────────────────────┘ **(3)**

| 8.4 | $h(t) = -5t^2 + 25t$ $30 = -5t^2 + 25t$ $0 = -5t^2 + 25t - 30$ $0 = t^2 - 5t + 6$ $0 = (t-2)(t-3)$ **OR / OF** $t = \dfrac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(6)}}{2(1)}$ $t = 2\text{s}$ or / of $t = 3\text{s}$ | ✓ equating to/*gelykstelling aan* 30   **A** ✓ factors/ *faktore* or/*of* **SF**   **CA** ✓ both values of/*beide waardes van t* **CA** **NPU** (3) **[11]** |

QUESTION/*VRAAG* 9

9.1.1	$\int \left(10^x + 6\right)dx$ $= \dfrac{10^x}{\ln 10} + 6x + C$	✓ $\dfrac{10^x}{\ln 10}$ **A** ✓ $6x$ **A** ✓ C **A** (3)
9.1.2	$\int \left(x^4(x+2) - 2x^{-3}\right)dx$ $= \int \left(x^5 + 2x^4 - 2x^{-3}\right)dx$ $= \dfrac{x^6}{6} + \dfrac{2x^5}{5} + x^{-2} + C$ <table><tr><td>**Note: No penalty if C is omitted** *Nota: Geen penaliseering indien C weggelaat is*</td></tr></table>	✓ $x^5 + 2x^4$ **A** ✓ $\dfrac{x^6}{6}$ **CA** ✓ $\dfrac{2x^5}{5}$ **CA** ✓ x^{-2} **A** (4)
9.2	$A = -\int_2^4 \left(\dfrac{3}{x} - 4\right)dx$ $= -\left(3\ln x - 4x\right)\Big\|_2^4$ $= -\left[-\left[3\ln(4) - 4(4)\right] - \left[3\ln(2) - 4(2)\right] \right]$ $\approx 5{,}92$ square units/*vierkante eenhede* **OR/*OF*** $A = \int_2^4 \left(\dfrac{3}{x} - 4\right)dx$ $= \left(3\ln x - 4x\right)\Big\|_2^4$ $= \left[3\ln(4) - 4(4)\right] - \left[3\ln(2) - 4(2)\right]$ $\approx -5{,}92$ $\therefore A \approx 5{,}92$ square units/ *vierkante eenhede*	✓Area notation using integrals/ *Oppervlakte-notasie met gebruik van integrale* **A** ✓ $3\ln x$ **A** ✓ $-4x$ **A** ✓✓ **SF** **CA** ✓Shaded area/*gearseerde oppervaklte* **CA** **OR/*OF*** ✓Area notation using integrals/ *Oppervlakte-notasie met gebruik van integrale* **A** ✓ $3\ln x$ **A** ✓ $-4x$ **A** ✓✓ **SF** **CA** ✓*positive* shaded area/*positiewe gearseerde oppervaklte* **CA** **NPU NPR** (6) **[13]**

TOTAL/*TOTAAL*:   **150**