**NATIONAL
SENIOR CERTIFICATE**

GRADE/*GRAAD* 12

MATHEMATICS P1/*WISKUNDE V1*

FEBRUARY/MARCH/FEBRUARIE/MAART 2015

MEMORANDUM

MARKS: 150
PUNTE: 150

This memorandum consists of 18 pages.
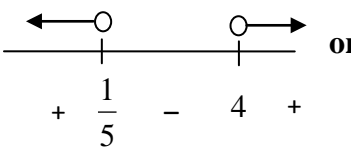*Hierdie memorandum bestaan uit 18 bladsye.*

NOTE:
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent accuracy applies in all aspects of the marking memorandum.

LET WEL:
- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk slegs die EERSTE poging.*
- *Volgehoue akkuraatheid is DEURGAANS op ALLE aspekte van die memorandum van toepassing.*

QUESTION/*VRAAG* 1

1.1.1	$(x+4)(x-5)=0$ $\therefore x = -4$ or $x = 5$	✓ factors/*faktore* ✓ answers/a*ntwoorde* (2)
1.1.2	$2x^2 - 11x + 7 = 0$ $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \dfrac{-(-11) \pm \sqrt{(-11)^2 - 4(2)(7)}}{2(2)}$ $= 4{,}77$ or $0{,}73$ **OR/*OF*** $2x^2 - 11x + 7 = 0$ $x^2 - \dfrac{11}{2}x + \dfrac{7}{2} = 0$ $x^2 - \dfrac{11}{2}x + \left(\dfrac{1}{2}\cdot\dfrac{11}{2}\right)^2 + \dfrac{7}{2} - \left(\dfrac{1}{2}\cdot\dfrac{11}{2}\right)^2 = 0$ $\left(x - \dfrac{11}{4}\right)^2 + \dfrac{7}{2} - \dfrac{121}{16} = 0$ $\left(x - \dfrac{11}{4}\right)^2 = \dfrac{121 - 56}{16}$ $x - \dfrac{11}{4} = \pm\sqrt{\dfrac{65}{16}}$ $\therefore x = \dfrac{11}{4} + \dfrac{\sqrt{65}}{4}$ or $x = \dfrac{11}{4} - \dfrac{\sqrt{65}}{4}$ $x = 4{,}77$ $x = 0{,}73$	✓ substitution into correct formula/s*ubstitusie* in korrekte formule ✓ 4,77 ✓ 0,73 (3) ✓ correct completion of the square/*korrekte voltooiing van die vierkant* ✓ 4,77 ✓ 0,73 (3)

1.1.3	$5x^2 - 21x + 4 > 0$ $(5x-1)(x-4) > 0$ $x < \dfrac{1}{5}$ or/*of* $x > 4$ **or**	✓ standard form/ *standaardvorm* ✓ factors/*faktore* ✓ $x < \dfrac{1}{5}$ ✓ $x > 4$ ✓ of (5)
1.1.4	$2^{2x} - 6.2^x = 16$ $2^{2x} - 6.2^x - 16 = 0$ $\left(2^x - 8\right)\left(2^x + 2\right) = 0$ $2^x = 2^3$ or/*of* $2^x = -2$ $x = 3$ or/*of* No Solution or $2^x \neq -2$	✓ factors/*faktore* ✓no solution to/ *geen oplossing* $2^x = -2$ ✓ $2^x = 2^3$ ✓ answer/*antw.* (4)

1.2	$y = 2x - 1$	✓ y the subject/ *die onderwerp*
	$x^2 - x(2x-1) + (2x-1)^2 = 7$	
	$x^2 - 2x^2 + x + 4x^2 - 4x + 1 = 7$	✓ substitution/*substitusie*
	$3x^2 - 3x - 6 = 0$	✓ simplification/*vereenv.*
	$x^2 - x - 2 = 0$	
	$(x-2)(x+1) = 0$	✓ factors/*faktore*
	$x = 2$ or/*of* $x = -1$	✓ x-values/*waardes*
	$y = 3$ or/*of* $y = -3$	✓ y-values/*waardes*
		(6)
	OR/*OF*	
	$x = \dfrac{y}{2} + \dfrac{1}{2}$	✓ x the subject/ *die onderwerp*
	$\left(\dfrac{y}{2} + \dfrac{1}{2}\right)^2 - \left(\dfrac{y}{2} + \dfrac{1}{2}\right)y + y^2 = 7$	✓ substitution/*substitusie*
	$\dfrac{y^2}{4} + \dfrac{y}{2} + \dfrac{1}{4} - \dfrac{y^2}{2} - \dfrac{y}{2} + y^2 = 7$	✓ simplification/*vereenv.*
	$\times 4 :\ y^2 + 2y + 1 - 2y^2 - 2y + 4y^2 - 28 = 0$	
	$\quad\quad 3y^2 - 27 = 0$	
	$\quad\quad y^2 - 9 = 0$	
	$\quad\quad (y-3)(y+3) = 0$	✓ factors/*faktore*
	$\therefore y = 3 \quad$ or $\quad y = -3$	✓ y-values/*waardes*
	$\therefore x = \dfrac{3}{2} + \dfrac{1}{2} \quad\quad x = \dfrac{-3}{2} + \dfrac{1}{2}$	
	$\ x = 2 \quad\quad\quad x = -1$	✓ x-values/*waardes*
		(6)
1.3.1	$k = -2$ or/*of* $k = 2$	✓✓ answer/*antw.* (2)
1.3.2	$k = -3$	✓ -3 (1)

1.4	$\sqrt{\dfrac{7^{2014}-7^{2012}}{12}}$	
	$=\sqrt{\dfrac{7^{2012}\left(7^2-1\right)}{12}}$	✓ $\dfrac{7^{2012}\left(7^2-1\right)}{12}$
	$=\sqrt{\dfrac{7^{2012}.48}{12}}$	
	$=\sqrt{7^{2012}.4}$	✓ $\sqrt{7^{2012}.4}$
	$=2.7^{1006}$	✓ 2.7^{1006} ✓
	$a=2;\;b=1006$	**OR/*OF*** ✓$a=2$ ✓$b=1006$
		(4) **[27]**

QUESTION/*VRAAG* 2

2.1	$S_n=a+\left(a+d\right)+\left(a+2d\right)+...+a+(n-1)d$ $S_n=a+\left(n-1\right)d+a+\left(n-2\right)d+a+\left(n-3\right)d+...+a$ $2S_n=n\left(2a+\left(n-1\right)d\right)$ $S_n=\dfrac{n}{2}\left[2a+\left(n-1\right)d\right]$	✓ first series/*eerste reeks* ✓series reversed/*reeks omgekeer* ✓ sum/*som* ✓ division/*deling* (4)
2.2	$\displaystyle\sum_{k=1}^{50}(100-3k)=97+94+91+...$ $T_1=a=97$ $d=-3$ $n=50-1+1=50$ $S_n=\dfrac{n}{2}[2a+(n-1)d]$ $\quad=\dfrac{50}{2}[2(97)+49(-3)]$ $\quad=1175$ **OR/*OF*** $T_1=a=97$ $l=100-3(50)=-50$ $n=50-1+1=50$ $S_n=\dfrac{n}{2}[a+l]$ $\quad=\dfrac{50}{2}[97-50]$ $\quad=1175$	✓$a=97$ ✓$d=-3$ ✓$n=50$ ✓ answer/*antwoord* (4) ✓$a=97$ ✓$l=-50$ ✓$n=50$ ✓ answer/*antwoord* (4)

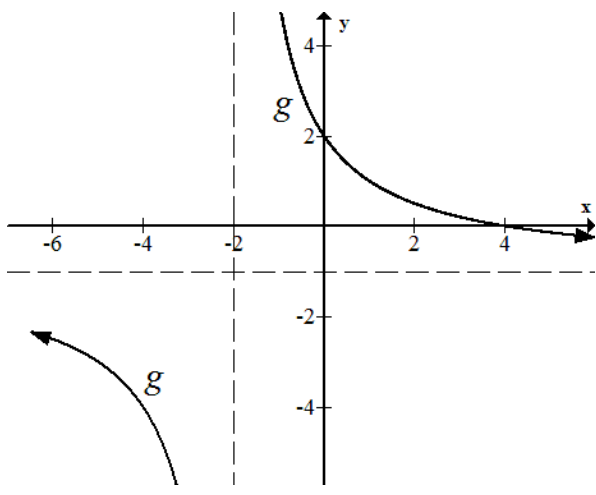| 2.3.1 (a)	$T_5 - T_4 = 25$	✓ answer/*antwoord* (1)
2.3.1 (b)	$T_{70} - T_{69} = 7 + (69-1)(6)$ $= 415$	✓ $n = 69$ ✓ $7 + (69-1)(6)$ ✓ answer/*antw.* (3)
2.3.2	$T_{89} - T_{69} = (T_{70} - T_{69}) + (T_{71} - T_{70}) + ... + (T_{89} - T_{88})$ $= 415 + 421 + ...$ to 20 terms $= \dfrac{20}{2}[2(415) + 19(6)]$ $= 9440$ $T_{69} = T_{89} - ($ sum of the differences from/*som van die verskille van* T_{69} to T_{89} $)$ $T_{69} = 23594 - 9440$ $= 14154$ **OR/*OF*** 7 13 19 25 ⌄ ⌄ ⌄ 6 6 6 $\therefore 2a = 6$ $a = 3$ $3a + b = 7$ $b = -2$ $T_{89} = 3(89)^2 - 2(89) + c = 23594$ $\therefore c = 9$ $\therefore T_n = 3n^2 - 2n + 9$ $\therefore T_{69} = 3(69)^2 - 2(69) + 9$ $\therefore T_{69} = 14154$	✓ expansion/*uitbreiding* ✓ $n = 20$ ✓ method/*metode* ✓ $a = 415$ ✓ answer/*antwoord* (5) ✓ a and/*en b* ✓ T_{89} (subst $n = 89$) ✓ T$_n$ ✓ substitution/*substitusie* ✓ answer/*antwoord* (5)

OR/*OF*

$$7 \quad 13 \quad 19 \quad 25$$
$$\searrow \quad \searrow \quad \searrow$$
$$6 \qquad 6 \qquad 6$$

$\therefore 2a = 6$

$\quad a = 3$

$7 - 6 = 1$

$T_1 - T_0 = 1$

$a + b + c - c = 1$

$3 + b = 1$

$b = -2$

$T_{89} = 3(89)^2 - 2(89) + c = 23594$

$\therefore c = 9$

$\therefore T_n = 3n^2 - 2n + 9$

$\therefore T_{69} = 3(69)^2 - 2(69) + 9$

$\therefore T_{69} = 14154$

✓ *a* and/*en b*

✓ T_{89} (subst $n = 89$)

✓ T_n

✓ substitution/*substitusie*
✓ answer/*antwoord*

(5)

[17]

OR/*OF*

$T_{n+1} - T_n = 7 + 6(n-1)$

$\therefore T_{89} - T_1 = \sum_{n=1}^{88} (T_{n+1} - T_n)$

$\qquad = \dfrac{n}{2}[2a + (n-1)d]$

$\qquad = \dfrac{88}{2}[14 + 87 \times 6]$

$\qquad = 23584$

$\therefore T_1 = 23594 - 23584 = 10$

$\therefore T_{69} - 10 = \sum_{n=1}^{68} (T_{n+1} - T_n)$

$\qquad = 34(15 + 67 \times 6) = 14144$

$\therefore T_{69} = 14154$

✓ formula/*formule*

✓ value of/*waarde van* S_{88}

✓ first term value/
eerste term waarde

✓ substitution/*substitusie*
✓ answer/*antwoord*

(5)

[17]

QUESTION 3

3.1	$r = \dfrac{40,5}{45} = 0,9$ $T_{12} = 45(0,9)^{12-1}$ $= 14,12147682...$ $= 14,12$	$\checkmark r = 0,9$ $\checkmark$ substitution into correct formula/*substitusie in korrekte formule* $\checkmark$ answer/*antwoord* (3)
3.2	$r = 0,9$ $-1 < 0,9 < 1$	$\checkmark$ answer/*antwoord* (1)
3.3	$S_\infty = \dfrac{45}{1-0,9}$ $S_\infty = 450$	$\checkmark$ substitution/*substitusie* $\checkmark$ 450 (2)
3.4	$S_\infty - S_n < 1$ $S_\infty - S_n = 450 - \dfrac{45\left(1-(0,9)^n\right)}{1-0,9}$ $S_\infty - S_n = 450 - 450\left(1-(0,9)^n\right)$ $450(0,9)^n < 1$ $(0,9)^n < \dfrac{1}{450}$ $\log(0,9)^n < \log\dfrac{1}{450}$ $n.\log(0,9) < \log\dfrac{1}{450}$ $n > \dfrac{\log\dfrac{1}{450}}{\log(0,9)}$ $n > 57,98...$ Smallest value/*Kleinste waarde: n* = 58	$\checkmark\ 450 - \dfrac{45\left(1-(0,9)^n\right)}{1-0,9}$ $\checkmark\ (0,9)^n = \dfrac{1}{450}$ $\checkmark$ introducing/*gebruik* logs $\checkmark$ making *n* the subject/*maak n die onderwerp* $\checkmark\ n = 58$ (5) **[11]**

QUESTION/*VRAAG* 4

4.1	$x = -2$ $y = -1$	✓ $x = -2$ ✓ $y = -1$ (2)
4.2.1	$g(0) = \dfrac{6}{0+2} - 1$ $= 2$ y-intercept/*afsnit* $(0 \ ; 2)$	✓ answer/*antwoord* (1)
4.2.2	$0 = \dfrac{6}{x+2} - 1$ $1 = \dfrac{6}{x+2}$ $x + 2 = 6$ $x = 4$ x-intercept/*afsnit* $(4 \ ; 0)$	✓ equating to/*stel gelyk aan* 0 ✓ answer/*antwoord* (2)
4.3		✓ asymptotes/*asimptote* ✓ intercepts/*afsnitte* ✓ shape/*vorm* (3)
4.4	$y + 1 = -(x + 2)$ $y = -x - 3$ **OR/*OF*** Using general formula/*Gebruik algemene formule*: $y = -(x + p) + q$ $y = -(x + 2) - 1$ $y = -x - 3$	✓$m = -1$ ✓substitution of $(-2 \ ; -1)$ ✓answer (3) ✓formula/*formule* ✓substitution of p and q values/*substitusie van p- en q-waardes* ✓answer/*antwoord* (3)
4.5	$x > -2$	✓✓ answer (2) **[13]**

QUESTION/*VRAAG* 5

5.1	$9 = a^2$ $a = 3$ **OR/*OF*** $f^{-1}(x) = \log_a x$ $2 = \log_a 9$ $a^2 = 9 = 3^2$ $\therefore a = 3$	✓ $9 = a^2$ ✓ $a = 3$ (2) ✓ $9 = a^2$ ✓ $a = 3$ (2)

5.2	$g(x) = 3^{-x}$
	
	 OR/*OF*
	 $g(x) = \left(\dfrac{1}{3}\right)^x$
		✓ answer/*antwoord*
		          (1)
		
		 ✓ answer/*antwoord*
		          (1)

5.3	$x \geq 9$
	
	 OR/*OF*
	
	 $f^{-1}(x) = \log_3 x$
	 $\log_3 x = 2$
	 $x = 3^2 = 9$
	 $\therefore x \geq 9$
	
	 OR/*OF*
	
	 $\log_3 x \geq 2$
	 $x \geq 3^2$
	 $\therefore x \geq 9$
		✓✓ answer/*antwoord*
		          (2)
		
		 ✓✓ answer/*antwoord*
		          (2)
		
		 ✓✓ answer/*antwoord*
		          (2)

5.4	Yes/*Ja*. For every *y*-value there is only one *x* such that/*Vir elke y-waarde is daar slegs een x sodanig dat* $y = f(x)$. **OR/*OF*** Yes/*Ja*. *f* is a one-to-one relation/*is 'n een-tot-een-relasie*.	✓ Yes/*Ja* ✓ Reason/*Rede* (2) ✓ Yes/*Ja* ✓ Reason/*Rede* (2) **[7]**

QUESTION/*VRAAG* 6

6.1	$-3 \le x \le 2$	✓ critical values/ *kritiese waardes* ✓ notation/*notasie* (2)
6.2	$f: \quad y = a(x - x_1)(x - x_2)$ $y = a(x+3)(x-2)$ $-8 = a(1+3)(1-2)$ $-8 = -4a$ $2 = a$ $y = 2(x+3)(x-2)$ $y = 2x^2 + 2x - 12$ $b = 2$ and/*en* $c = -12$ **OR/*OF*** $y = a\left(x + \dfrac{1}{2}\right)^2 + q$ $0 = a\left(2 + \dfrac{1}{2}\right)^2 + q \quad \rightarrow \quad 0 = \dfrac{25}{4}a + q \quad ....(1)$ $-8 = a\left(1 + \dfrac{1}{2}\right)^2 + q \quad \rightarrow \quad -8 = \dfrac{9}{4}a + q \quad .....(2)$ $(1) - (2): 8 = 4a$ $\qquad a = 2$ $q = 0 - \dfrac{25}{4}(2) = -\dfrac{25}{2} = -12{,}5$ $y = 2\left(x + \dfrac{1}{2}\right)^2 - 12\dfrac{1}{2}$ $y = 2\left(x^2 + x + \dfrac{1}{4}\right) - 12\dfrac{1}{2}$ $y = 2x^2 + 2x + \dfrac{1}{2} - 12\dfrac{1}{2}$ $y = 2x^2 + 2x - 12$ $\therefore b = 2$ and $c = -12$ **OR/*OF***	✓ $y = a(x+3)(x-2)$ ✓ substitute/*vervang* $(1 ; -8)$ ✓ $a = 2$ ✓ $b = 2$ and/*en* ✓ $c = -12$ (5) ✓ equation/*vergelyking* 1 ✓ equation/*vergelyking* 2 ✓ $a = 2$ ✓ substitution/*substitusie* ✓ $b = 2$ and/*en* ✓ $c = -12$ (5)

	$f'(x) = 2ax + b$	
	$f'\left(-\dfrac{1}{2}\right) = 2a\left(-\dfrac{1}{2}\right) + b = 0$	
	$\therefore a = b$	
	$(-3;0): 9a - 3b + c = 0$	
	$\therefore 6a + c = 0 \ldots\ldots\ldots\ldots(1)$	✓equation/*vergelyking* 1
	$(1;-8): a + b + c = -8$	
	$\therefore 2a + c = -8 \ldots\ldots\ldots\ldots(2)$	✓equation/*vergelyking* 2
	$(1) - (2): \quad 4a = 8$	
	$\therefore a = 2$	✓$a = 2$
	$\Rightarrow b = 2$	✓$b = 2$
	$\therefore c = -12$	✓$c = -12$
		(5)
6.3	$x = -\dfrac{b}{2a}$	
	$x = -\dfrac{2}{2(2)} = -\dfrac{1}{2}$	✓$x = -\dfrac{1}{2}$
	$y = \dfrac{1}{2} - 1 - 12$	✓substitution/*substitusie*
	$y = -12\dfrac{1}{2}$	
	$\text{TP}\left(-\dfrac{1}{2}\ ;\ -12\dfrac{1}{2}\right)$	✓y-value/*waarde*
	OR/*OF*	(3)

	$y = 2[x^2 + x - 6]$	
	$y = 2\left[x^2 + x + \left(\frac{1}{2}.1\right)^2 - 6 - \left(\frac{1}{2}.1\right)^2 \right]$	✓ method/*metode*
	$= 2\left[\left(x + \frac{1}{2}\right)^2 - 6{,}25 \right]$	
	$= 2\left(x + \frac{1}{2}\right)^2 - 12{,}5$	
	$\text{TP}\left(-\frac{1}{2} ; -12{,}5\right)$	✓ x-value/*waarde* ✓ y-value/*waarde* (3)
	OR/*OF* $x = \dfrac{-3 + 2}{2} = -\dfrac{1}{2}$	
	$y = 2\left(-\frac{1}{2}\right) + 2\left(-\frac{1}{2}\right) - 12$	✓ method/*metode* ✓ x-value/*waarde*
	$y = -12\frac{1}{2}$	
	$\text{TP}\left(-\frac{1}{2} ; -12{,}5\right)$	✓ y-value/*waarde* (3)
	OR/*OF* $f(x) = y = 2x^2 + 2x - 12$	
	$f'(x) = 4x + 2$	
	$4x + 2 = 0$	
	$4x = -2$	✓ method/*metode*
	$x = -\frac{1}{2}$	
	$\therefore y = 2\left(-\frac{1}{2}\right)^2 + 2\left(-\frac{1}{2}\right) - 12 = -\frac{25}{2}$	✓ x-value/*waarde*
	$\text{TP}\left(-\frac{1}{2} ; -\frac{25}{2}\right)$	✓ y-value/*waarde* (3)
6.4	$x = \dfrac{13}{2}$	✓✓ answer/i (2)
6.5	$f'(x) = 4x + 2$ $m = f'(1) = 4(1) + 2$ $m = 6$	✓ $y' = 4x + 2$ ✓ subst. $x = 1$ ✓ answer/*antwoord* (3) **[15]**

QUESTION/*VRAAG* 7

7.1.1	$R\,400 \times (44 \times 12)$ $= R\,211\,200$	✓ $R\,400 \times (44 \times 12)$ ✓ $R\,211\,200$ (2)
7.1.2	$F = \dfrac{x\left[(1+i)^n - 1\right]}{i}$ $= \dfrac{400\left[\left(1+\dfrac{0,08}{12}\right)^{528} - 1\right]}{\dfrac{0,08}{12}}$ $= R\,1\,943\,524,42$	✓ $x = 400$ ✓ $n = 528$ ✓ $i = \dfrac{0,08}{12}$ ✓ substitution into correct formula/*substitusie in korrekte formule* ✓ answer/*antwoord* (5)
7.1.3	$P = \dfrac{x[1-(1+i)^{-n}]}{i}$ $2000000 = \dfrac{x\left[1-\left(1+\dfrac{0,1}{12}\right)^{-300}\right]}{\dfrac{0,1}{12}}$ $x = R\,18\,174,01$ **OR/*OF*** $2000000\left(1+\dfrac{0,1}{12}\right)^{300} = \dfrac{x\left(\left(1+\dfrac{0,1}{12}\right)^{300} - 1\right)}{\dfrac{0,1}{12}}$ $x = R\,18174,01$	✓ $P = 2000000$ ✓ $n = 300$ and/*en* $i = \dfrac{0,1}{12}$ ✓ substituting into correct formula/*substitusie in korrekte formule* ✓ answer/*antwoord* (4) ✓ $P = 2000000$ ✓ $n = 300$ and/*en* $i = \dfrac{0,1}{12}$ ✓ equating/*stel gelyk* ✓ answer/*antwoord* (4)
7.2	Let P_X and P_Y be the populations of the two towns at the beginning of 2010./*Laat* P_X *en* P_Y *die bevolkings wees van die twee dorpe aan die begin van 2010.* $A_X = A_Y$ $P_X(1-0,08)^3 = P_Y(1+0,12)^3$ $\dfrac{P_X}{P_Y} = \dfrac{(1+0,12)^3}{(1-0,08)^3}$ $= \dfrac{1,404...}{0,778...}$ $= 1,8:1$	✓ equating/*stel gelyk* ✓ $A_X = P_X(1-0,08)^3$ ✓ $A_Y = P_Y(1+0,12)^3$ ✓ answer/*antwoord* (4) **[15]**

QUESTION/*VRAAG* 8

8.1	$f(x+h) = 2(x+h)^2 + 4$ $\qquad = 2x^2 + 4xh + 2h^2 + 4$ $f(x+h) - f(x) = 2x^2 + 4xh + 2h^2 + 4 - 2x^2 - 4$ $\qquad\qquad\qquad = 4xh + 2h^2$ $f'(x) = \lim\limits_{h \to 0} \dfrac{4xh + 2h^2}{h}$ $\qquad = \lim\limits_{h \to 0} \dfrac{h(4x + 2h)}{h}$ $\qquad = \lim\limits_{h \to 0} (4x + 2h)$ $\qquad = 4x$	✓ $2x^2 + 4xh + 2h^2 + 4$ ✓ $4xh + 2h^2$ ✓ $\lim\limits_{h \to 0} \dfrac{h(4x + 2h)}{h}$ ✓ $4x$ (4)
8.2.1	$f(x) = -3x^2 + 5\sqrt{x}$ $f(x) = -3x^2 + 5x^{\frac{1}{2}}$ $f'(x) = -6x + \dfrac{5}{2}x^{-\frac{1}{2}}$	✓ $5x^{\frac{1}{2}}$ ✓ $-6x$ ✓ $\dfrac{5}{2}x^{-\frac{1}{2}}$ (3)
8.2.2	$p(x) = \left(\dfrac{1}{x^3} + 4x\right)^2$ $\qquad = \dfrac{1}{x^6} + \dfrac{8}{x^2} + 16x^2$ $\qquad = x^{-6} + 8x^{-2} + 16x^2$ $p'(x) = -6x^{-7} - 16x^{-3} + 32x$ **OR/*OF*** $p(x) = (x^{-3} + 4x)^2$ by making use of the chain rule : $p'(x) = 2(x^{-3} + 4x)(-3x^{-4} + 4)$ $p'(x) = -6x^{-7} - 16x^{-3} + 32x$	✓ $\dfrac{1}{x^6} + \dfrac{8}{x^2} + 16x^2$ ✓ $x^{-6} + 8x^{-2} + 16x^2$ ✓✓ answer/*antwoord* (4) ✓✓ $2(x^{-3} + 4x)$ ✓✓ $(-3x^{-4} + 4)$ (4)
8.3.1	$h'(x) = 3x^2 - 14x + 14$	✓ finding/*kry* $h'(x)$ (1)
8.3.2	At/*By* B: $\qquad h'(x) = 0$ $3x^2 - 14x + 14 = 0$ $x = \dfrac{14 \pm \sqrt{(-14)^2 - 4(3)(14)}}{2(3)}$ $= 1{,}45 \text{ or } 3{,}22$ $\qquad\qquad n/a$	✓ derivative equal to/ *afgeleide gelyk aan* 0 ✓ substitution into correct formula/*substitusie in korrekte formule* ✓ x-value of/*x-waarde van* 1,45 (3)

| 8.3.3 | $x^3 - 7x^2 + 14x - 8 = (x-1)(x^2 - 6x + 8)$
 $ = (x-1)(x-2)(x-4)$

 $\text{C}(4;0)$

 OR/*OF*

 $x_c > 3{,}22$
 $h(4) = (4)^3 - 7(4)^2 + 14(4) - 8 = 0$
 $\therefore x_c = 4$ | ✓ $(x-1)$
 ✓ $x^2 - 6x + 8$
 ✓ $(x-2)(x-4)$

 ✓coordinates of/*koördinate*
   van C   (4)

 ✓ $x_c > 3{,}22$
 ✓substitution of/
   substitusie van 4
 ✓ $h(4) = 0$
 ✓ x_c (4) |
| 8.3.4 | $h'(x) = 3x^2 - 14x + 14$
 $h''(x) = 6x - 14$
 $6x - 14 < 0$
 $6x < 14$
 $\therefore x < \dfrac{7}{3}$
 $\therefore k = \dfrac{7}{3}$ | ✓ $h''(x) = 6x - 14$
 ✓ $6x - 14 < 0$

 ✓ $k = \dfrac{7}{3}$
        (3)
 [22] |

QUESTION/*VRAAG* 9

9.1	$\pi r^2 h = 6$ $h = \dfrac{6}{\pi r^2}$	$\checkmark h = \dfrac{6}{\pi r^2}$ (1)
9.2	$\begin{aligned} S &= 10\left(2\pi r^2 + 2\pi rh + 4\pi r^2\right) \\ &= 10\left[2\pi rh + 6\pi r^2\right] \\ &= 20\pi rh + 60\pi r^2 \\ &= 20\pi r\left(\dfrac{6}{\pi r^2}\right) + 60\pi r^2 \\ &= 60\pi r^2 + \dfrac{120}{r} \end{aligned}$ **OR/*OF*** Area of/*van* 10 spheres/*sfere* $= 10 \times 4 \times \pi \times r^2 = 40\pi r^2$ Area of/*van* 10 cylinders/*silinders* $= 10(2\pi r^2 + 2\pi r h)$ $\qquad = 10(2\pi r^2 + 2\pi r \dfrac{6}{\pi r^2})$ $\qquad = 20\pi r^2 + \dfrac{120}{r}$ Total area/*Totale area* $= 40\pi r^2 + 20\pi r^2 + \dfrac{120}{r}$ $\qquad = 60\pi r^2 + \dfrac{120}{r}$	$\checkmark\checkmark\, 10\left(2\pi r^2 + 2\pi rh + 4\pi r^2\right)$ $\checkmark\, 20\pi rh + 60\pi r^2$ $\checkmark$ substitution/*substitusie* (4) $\checkmark$ area of 10 spheres/ *area van 10 sfere* $\checkmark$ area of 10 cylinders/ *area van 10 silinders* $\checkmark$ substitution/*substitusie* $\checkmark$ simplification/*vereen-voudiging* (4)
9.3	$S' = 120\pi r - 120r^{-2} = 0$ $120\pi r - \dfrac{120}{r^2} = 0$ $120\pi r^3 - 120 = 0$ $r^3 = \dfrac{120}{120\pi}$ $\therefore r = \dfrac{1}{\pi^{\frac{1}{3}}} = 0{,}68 \text{ cm}$	$\checkmark\, 120\pi r - 120r^{-2}$ $\checkmark = 0$ $\checkmark\, r^3 = \dfrac{120}{120\pi}$ $\checkmark$ answer/*antwoord* (4) **[9]**

QUESTION/*VRAAG* 10

10.1.1	$d = 5$ $e = 4$ $f = 7$ $g = 5$	✓$d = 5$ ✓$e = 4$ ✓$f = 7$ ✓$g = 5$ (4)
10.1.2a	P(A and/*en* B and/*en* C) = $\dfrac{4}{54} = \dfrac{2}{27}$	✓$\dfrac{4}{54} = \dfrac{2}{27}$ (1)
10.1.2b	P(A or/*of* B or/*of* C) = $\dfrac{48}{54} = \dfrac{8}{9}$	✓$\dfrac{48}{54} = \dfrac{8}{9}$ (1)
10.1.2c	P(only/*slegs* C) = $\dfrac{7}{54}$	✓$\dfrac{7}{54}$ (1)
10.1.2d	P(that a country uses exactly two methods/*dat 'n land presies twee metodes gebruik*) = $\dfrac{5+4+8}{54} = \dfrac{17}{54}$	✓$\dfrac{17}{54}$ (1)
10.2.1	P(selects *Midnight* as drama/*kies Midnight as drama*) = $\dfrac{1}{5}$	✓✓ answer/*antwoord* (2)
10.2.2	Number of different selections of drama, romance and comedy/*Aantal verskillende keuses van drama, liefdesverhale en komedie* = $5 \times 4 \times 3 = 60$	✓ product/*produk* ✓answer/*antwoord* (2)
10.2.3	P(select *Last Hero* and *Laughing Dragon*/*kies Last Hero en Laughing Dragon*) = $\dfrac{1}{5} \times \dfrac{1}{3} = \dfrac{1}{15}$ **OR/*OF*** P(select *Last Hero* and *Laughing Dragon*/*kies Last Hero en Laughing Dragon*) = $\dfrac{1 \times 4 \times 1}{60} = \dfrac{1}{15}$	✓ product/*produk* ✓answer/*antwoord* (2) ✓ product/*produk* ✓ answer/*antwoord* (2) **[14]**
	TOTAL/TOTAAL:	**150**