basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL
SENIOR CERTIFICATE

GRADE/*GRAAD* 12

MATHEMATICS P1/*WISKUNDE V1*

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MEMORANDUM

MARKS: 150
PUNTE: 150

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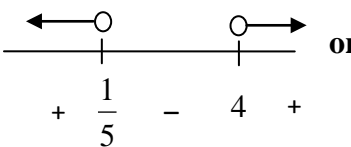*Hierdie memorandum bestaan uit 18 bladsye.*

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.*
	$\times 4: \quad y^2 + 2y + 1 - 2y^2 - 2y + 4y^2 - 28 = 0$	
	$3y^2 - 27 = 0$	
	$y^2 - 9 = 0$	
	$(y - 3)(y + 3) = 0$	✓ factors/*faktore*
	$\therefore y = 3$ or $y = -3$	✓y-values/*waardes*
	$\therefore x = \dfrac{3}{2} + \dfrac{1}{2} \qquad x = \dfrac{-3}{2} + \dfrac{1}{2}$	
	$x = 2 \qquad\qquad x = -1$	✓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	$S_n = a + (a + d) + (a + 2d) + ... + a + (n-1)d$	✓ first series/*eerste reeks*
	$S_n = a + (n-1)d + a + (n-2)d + a + (n-3)d + ... + a$	✓series reversed/*reeks omgekeer*
	$2S_n = n(2a + (n-1)d)$	✓ sum/*som*
	$S_n = \dfrac{n}{2}\left[2a + (n-1)d\right]$	✓ division/*deling*
		(4)
2.2	$\displaystyle\sum_{k=1}^{50}(100 - 3k) = 97 + 94 + 91 + ...$	
	$T_1 = a = 97$	✓$a = 97$
	$d = -3$	✓$d = -3$
	$n = 50 - 1 + 1 = 50$	✓$n = 50$
	$S_n = \dfrac{n}{2}[2a + (n-1)d]$	
	$= \dfrac{50}{2}[2(97) + 49(-3)]$	
	$= 1175$	✓ answer/*antwoord*
		(4)
	OR/*OF*	
	$T_1 = a = 97$	✓$a = 97$
	$l = 100 - 3(50) = -50$	✓$l = -50$
	$n = 50 - 1 + 1 = 50$	✓$n = 50$
	$S_n = \dfrac{n}{2}[a + l]$	
	$= \dfrac{50}{2}[97 - 50]$	
	$= 1175$	✓ answer/*antwoord*
		(4)
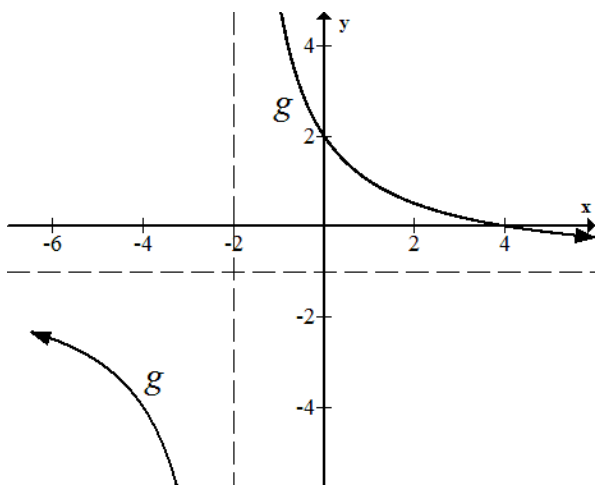
2.3.1 (a)	$T_5 - T_4 = 25$	✓ answer/*antwoord* (1)
2.3.1 (b)	$T_{70} - T_{69} = 7 + (69 - 1)(6)$ $= 415$	✓ $n = 69$ ✓ $7 + (69 - 1)(6)$ ✓ answer/*antw.* (3)
2.3.2	$T_{89} - T_{69} = (T_{70} - T_{69}) + (T_{71} - T_{70}) + ... + (T_{89} - T_{88})$ $= 415 + 421 + ...\text{to 20 terms}$ $= \dfrac{20}{2}[2(415) + 19(6)]$ $= 9440$ $T_{69} = T_{89} - (\text{sum of the differences from/}som\ van\ die$ $verskille\ van\ T_{69}\ to\ T_{89})$ $T_{69} = 23594 - 9440$ $\qquad = 14154$ **OR/*OF*** 7 13 19 25 6 6 6 $\therefore 2a = 6$ $\quad a = 3$ $3a + b = 7$ $\qquad b = -2$ $T_{89} = 3(89)^2 - 2(89) + c = 23594$ $\therefore c = 9$ $\therefore T_n = 3n^2 - 2n + 9$ $\therefore T_{69} = 3(69)^2 - 2(69) + 9$ $\therefore T_{69} = 14154$	✓ 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*

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

$\therefore 2a = 6$

$\quad a = 3$

$7 - 6 = 1$

$T_1 - T_0 = 1$

$a + b + c - c = 1$

$3 + b = 1$

$b = -2$

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

$\therefore c = 9$

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

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

$\therefore T_{69} = 14154$

✓ *a* and/*en b*

✓ T_{89} (subst $n = 89$)

✓ T_n

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

(5)

[17]

OR/*OF*

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

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

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

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

$\qquad = 23584$

$\therefore T_1 = 23594 - 23584 = 10$

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

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

$\therefore T_{69} = 14154$

✓ formula/*formule*

✓ value of/*waarde van* S_{88}

✓ first term value/
  eerste term waarde

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

(5)

[17]

QUESTION 3

3.1	$r = \dfrac{40,5}{45} = 0,9$ $T_{12} = 45(0,9)^{12-1}$ $\quad\quad = 14,12147682...$ $\quad\quad = 14,12$	$\checkmark r = 0,9$ $\checkmark$ 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	$g(0) = \dfrac{6}{0+2} - 1$ $\quad = 2$ y-intercept/*afsnit* $(0 ; 2)$	 ✓ answer/*antwoord* (1)
4.2.2	$0 = \dfrac{6}{x+2} - 1$ $1 = \dfrac{6}{x+2}$ $x + 2 = 6$ $\quad x = 4$ 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*** $y = a\left(x + \dfrac{1}{2}\right)^2 + q$ $0 = a\left(2 + \dfrac{1}{2}\right)^2 + q \quad \rightarrow \quad 0 = \dfrac{25}{4}a + q \quad ....(1)$ $-8 = a\left(1 + \dfrac{1}{2}\right)^2 + q \quad \rightarrow \quad -8 = \dfrac{9}{4}a + q \quad .....(2)$ $(1) - (2): 8 = 4a$ $\qquad\qquad a = 2$ $q = 0 - \dfrac{25}{4}(2) = -\dfrac{25}{2} = -12{,}5$ $y = 2\left(x + \dfrac{1}{2}\right)^2 - 12\dfrac{1}{2}$ $y = 2\left(x^2 + x + \dfrac{1}{4}\right) - 12\dfrac{1}{2}$ $y = 2x^2 + 2x + \dfrac{1}{2} - 12\dfrac{1}{2}$ $y = 2x^2 + 2x - 12$ $\therefore b = 2$ 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)

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

	$y = 2[x^2 + x - 6]$ $$y = 2\left[x^2 + x + \left(\frac{1}{2}.1\right)^2 - 6 - \left(\frac{1}{2}.1\right)^2 \right]$$ $$= 2\left[\left(x + \frac{1}{2}\right)^2 - 6{,}25 \right]$$ $$= 2\left(x + \frac{1}{2}\right)^2 - 12{,}5$$ $$\text{TP}\left(-\frac{1}{2}; -12{,}5\right)$$ **OR/*OF*** $$x = \frac{-3 + 2}{2} = -\frac{1}{2}$$ $$y = 2\left(-\frac{1}{2}\right) + 2\left(-\frac{1}{2}\right) - 12$$ $$y = -12\frac{1}{2}$$ $$\text{TP}\left(-\frac{1}{2}; -12{,}5\right)$$ **OR/*OF*** $$f(x) = y = 2x^2 + 2x - 12$$ $$f'(x) = 4x + 2$$ $$4x + 2 = 0$$ $$4x = -2$$ $$x = -\frac{1}{2}$$ $$\therefore y = 2\left(-\frac{1}{2}\right)^2 + 2\left(-\frac{1}{2}\right) - 12 = -\frac{25}{2}$$ $$\text{TP}\left(-\frac{1}{2}; -\frac{25}{2}\right)$$	✓ method/*metode* ✓ x-value/*waarde* ✓ y-value/*waarde* (3) ✓ method/*metode* ✓ x-value/*waarde* ✓ y-value/*waarde* (3) ✓ method/*metode* ✓ x-value/*waarde* ✓ 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	$R400 \times (44 \times 12)$ $= R211200$	$\checkmark$ $R400 \times (44 \times 12)$ $\checkmark$ $R211200$ (2)
7.1.2	$F = \dfrac{x\left[(1+i)^n - 1\right]}{i}$ $= \dfrac{400\left[\left(1 + \dfrac{0,08}{12}\right)^{528} - 1\right]}{\dfrac{0,08}{12}}$ $= R1\,943\,524,42$	$\checkmark$ $x = 400$ $\checkmark$ $n = 528$ $\checkmark$ $i = \dfrac{0,08}{12}$ $\checkmark$ substitution into correct formula/*substitusie in korrekte formule* $\checkmark$ answer/*antwoord* (5)
7.1.3	$P = \dfrac{x[1-(1+i)^{-n}]}{i}$ $2000000 = \dfrac{x\left[1 - \left(1 + \dfrac{0,1}{12}\right)^{-300}\right]}{\dfrac{0,1}{12}}$ $x = R18\,174,01$ **OR/*OF*** $2000000\left(1 + \dfrac{0,1}{12}\right)^{300} = \dfrac{x\left(\left(1 + \dfrac{0,1}{12}\right)^{300} - 1\right)}{\dfrac{0,1}{12}}$ $x = R18174,01$	$\checkmark$ P = 2000000 $\checkmark$ $n = 300$ and/*en* $i = \dfrac{0,1}{12}$ $\checkmark$ substituting into correct formula/*substitusie in korrekte formule* $\checkmark$ answer/*antwoord* (4) $\checkmark$ P = 2000000 $\checkmark$ $n = 300$ and/*en* $i = \dfrac{0,1}{12}$ $\checkmark$ equating/stel gelyk $\checkmark$ 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.* $A_X = A_Y$ $P_X (1 - 0,08)^3 = P_Y (1 + 0,12)^3$ $\dfrac{P_X}{P_Y} = \dfrac{(1 + 0,12)^3}{(1 - 0,08)^3}$ $= \dfrac{1,404...}{0,778...}$ $= 1,8 : 1$	$\checkmark$ equating/*stel gelyk* $\checkmark$ $A_X = P_X (1 - 0,08)^3$ $\checkmark$ $A_Y = P_Y (1 + 0,12)^3$ $\checkmark$ answer/*antwoord* (4) **[15]**

QUESTION/*VRAAG* 8

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

8.3.3	$x^3 - 7x^2 + 14x - 8 = (x-1)(x^2 - 6x + 8)$	✓ $(x-1)$
	$\qquad\qquad\qquad\qquad = (x-1)(x-2)(x-4)$	✓ $x^2 - 6x + 8$
		✓ $(x-2)(x-4)$
	$C(4;0)$	✓coordinates of/*koördinate*
		van C $\qquad$ (4)
	OR/*OF*	
	$x_c > 3{,}22$	
	$h(4) = (4)^3 - 7(4)^2 + 14(4) - 8 = 0$	✓ $x_c > 3{,}22$
	$\therefore x_c = 4$	✓substitution of/
		substitusie van 4
		✓ $h(4) = 0$
		✓ x_c $\qquad$ (4)
8.3.4	$h'(x) = 3x^2 - 14x + 14$	
	$h''(x) = 6x - 14$	✓ $h''(x) = 6x - 14$
	$6x - 14 < 0$	✓ $6x - 14 < 0$
	$6x < 14$	
	$\therefore x < \dfrac{7}{3}$	
	$\therefore k = \dfrac{7}{3}$	✓ $k = \dfrac{7}{3}$
		(3)
		[22]

QUESTION/*VRAAG* 9

9.1	$\pi r^2 h = 6$ $$h = \frac{6}{\pi r^2}$$	$\checkmark\ h = \frac{6}{\pi r^2}$ (1)
9.2	$S = 10\left(2\pi r^2 + 2\pi rh + 4\pi r^2\right)$ $= 10\left[2\pi rh + 6\pi r^2\right]$ $= 20\pi rh + 60\pi r^2$ $= 20\pi r\left(\dfrac{6}{\pi r^2}\right) + 60\pi r^2$ $= 60\pi r^2 + \dfrac{120}{r}$ **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* $= 10(2\pi r^2 + 2\pi rh)$ $= 10\left(2\pi r^2 + 2\pi r\dfrac{6}{\pi r^2}\right)$ $= 20\pi r^2 + \dfrac{120}{r}$ Total area/*Totale area* $= 40\pi r^2 + 20\pi r^2 + \dfrac{120}{r}$ $= 60\pi r^2 + \dfrac{120}{r}$	$\checkmark\checkmark\ 10\left(2\pi r^2 + 2\pi rh + 4\pi r^2\right)$ $\checkmark\ 20\pi rh + 60\pi r^2$ $\checkmark$ 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	$d = 5$ $e = 4$ $f = 7$ $g = 5$	$\checkmark d = 5$ $\checkmark e = 4$ $\checkmark f = 7$ $\checkmark g = 5$ (4)
10.1.2a	P(A and/*en* B and/*en* C) = $\dfrac{4}{54} = \dfrac{2}{27}$	$\checkmark \dfrac{4}{54} = \dfrac{2}{27}$ (1)
10.1.2b	P(A or/*of* B or/*of* C) = $\dfrac{48}{54} = \dfrac{8}{9}$	$\checkmark \dfrac{48}{54} = \dfrac{8}{9}$ (1)
10.1.2c	P(only/*slegs* C) = $\dfrac{7}{54}$	$\checkmark \dfrac{7}{54}$ (1)
10.1.2d	P(that a country uses exactly two methods/*dat 'n land presies twee metodes gebruik*) = $\dfrac{5 + 4 + 8}{54} = \dfrac{17}{54}$	$\checkmark \dfrac{17}{54}$ (1)
10.2.1	P(selects *Midnight* as drama/*kies Midnight as drama*) = $\dfrac{1}{5}$	$\checkmark\checkmark$ answer/*antwoord* (2)
10.2.2	Number of different selections of drama, romance and comedy/*Aantal verskillende keuses van drama, liefdesverhale en komedie* = $5 \times 4 \times 3 = 60$	$\checkmark$ product/*produk* $\checkmark$ 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*) = $\dfrac{1 \times 4 \times 1}{60} = \dfrac{1}{15}$	$\checkmark$ product/*produk* $\checkmark$ answer/*antwoord* (2) $\checkmark$ product/*produk* $\checkmark$ answer/*antwoord* (2) **[14]**
	TOTAL/TOTAAL:	**150**