basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12/*GRAAD* 12

MATHEMATICS P1/*WISKUNDE V1*

FEBRUARY/MARCH/*FEBRUARIE/MAART* 2016

MEMORANDUM

MARKS: 150
PUNTE: 150

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

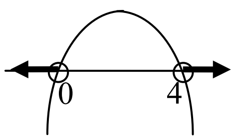
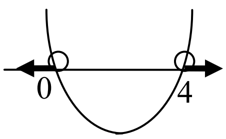
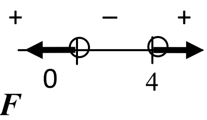
NOTE:

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

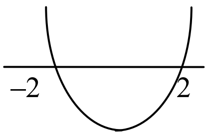
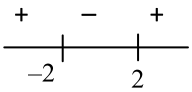
LET WEL:

- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die memorandum van toepassing.*

QUESTION/*VRAAG* 1

1.1.1	$x^2 - x - 12 = 0$ $(x-4)(x+3) = 0$ $x = 4$ or $x = -3$ **OR/*OF*** $x^2 - x - 12 = 0$ $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \dfrac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-12)}}{2(1)}$ $= 4$ or -3	✓factors ✓✓answers (3) ✓ substitution into formula ✓✓answers (3)
1.1.2	$x(x+3) - 1 = 0$ $x^2 + 3x - 1 = 0$ $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \dfrac{-3 \pm \sqrt{3^2 - 4(1)(-1)}}{2(1)}$ $= \dfrac{-3 \pm \sqrt{13}}{2}$	✓standard form ✓substitution into correct formula ✓answer (3)
1.1.3	$x(4-x) < 0$ $x < 0$ or $x > 4$  **OR/*OF*** $x(4-x) < 0$ $x(x-4) > 0$ $x < 0$ or $x > 4$  **OR/*OF*** 	✓ $x < 0$ ✓ $x > 4$ ✓or (3) ✓ $x < 0$ ✓ $x > 4$ ✓or (3)

1.1.4	$x=\dfrac{a^2+a-2}{a-1}$ $=\dfrac{(a+2)(a-1)}{a-1}$ $=a+2$ $=888\,888\,888\,890$	✓ $(a+2)(a-1)$ ✓answer (check ten eights written)/*tien agtstes geskryf* (2)
1.2	$y+7=2x$ $y=2x-7$ ....(1) $x^2-xy+3y^2=15$ substitute (1) in (2) : $x^2-x(2x-7)+3(2x-7)^2=15$ $x^2-2x^2+7x+3(4x^2-28x+49)=15$ $x^2-2x^2+7x+12x^2-84x+147-15=0$ $11x^2-77x+132=0$ $x^2-7x+12=0$ $(x-3)(x-4)=0$ $x=3$ or $x=4$ $y=2(3)-7$ $y=2(4)-7$ $y=-1$ $y=1$	✓ $y=2x-7$ ✓ substitution ✓standard form ✓factorisation ✓x-values ✓y-values (6)
	OR/*OF* $y+7=2x$ $x=\dfrac{y+7}{2}$ ....(1) $x^2-xy+3y^2=15$ ....(2) substitute (1) in (2) : $\left(\dfrac{y+7}{2}\right)^2-\left(\dfrac{y+7}{2}\right)y+3y^2=15$ $\dfrac{y^2+14y+49}{4}-\dfrac{y^2+7y}{2}+3y^2=15$ $y^2+14y+49-2y^2-14y+12y^2-60=0$ $11y^2-11=0$ $y^2-1=0$ $(y-1)(y+1)=0$ $y=-1$ $y=1$ $x=\dfrac{-1+7}{2}$ $x=\dfrac{1+7}{2}$ $x=3$ $x=4$	✓ $x=\dfrac{y+7}{2}$ ✓ substitution ✓standard form ✓factorisation ✓y-values ✓x-values (6)

1.3	$y = x + \frac{1}{x}$ $xy = x^2 + 1$ $x^2 - xy + 1 = 0$ Since x is real, this equation has real roots./*Omdat x reëel is, het die vergelyking reële wortels.* $\Delta \geq 0$ $y^2 - 4 \geq 0$ $(y-2)(y+2) \geq 0$  **OR/** ***OF***  $y \leq -2$ or $y \geq 2$	✓ $x^2 - xy + 1 = 0$ ✓ $\Delta \geq 0$ ✓ $y^2 - 4$ ✓factors ✓ $y \leq -2$ ✓ $y \geq 2$ (6) **[23]**

QUESTION/*VRAAG* 2

2.1.1	–2 0 3 7 **12** 2 3 4 5 1 1 1 The next term of the sequence is 12./*Die volgende term in die ry is 12.*	✓answer (1)
2.1.2	$2a = 1$ $a = \frac{1}{2}$ $3a + b = T_2 - T_1$ $3\left(\frac{1}{2}\right) + b = 2$ $b = \frac{1}{2}$ $a + b + c = T_1$ $\frac{1}{2} + \frac{1}{2} + c = -2$ $c = -3$ $\therefore T_n = \frac{1}{2}n^2 + \frac{1}{2}n - 3$ **OR/*OF***	✓value of a ✓ $3\left(\frac{1}{2}\right) + b = 2$ ✓value of b ✓ $\frac{1}{2} + \frac{1}{2} + c = -2$ ✓ value of c (5)

	$2a=1$ $a=\frac{1}{2}$ $T_n=an^2+bn+c$ $-2=\frac{1}{2}+b+c$..............T_1 $b+c=-\frac{5}{2}$.........................line 1 $0=2+2b+c$...............T_2 $2b+c=-2$.........................line 2 line 2 – line 1: $b=\frac{1}{2}$ substitute in line 1 or substitute in line 2 $\frac{1}{2}+c=-\frac{5}{2}$ $2\left(\frac{1}{2}\right)+c=-2$ $c=-3$ $\therefore T_n=\frac{1}{2}n^2+\frac{1}{2}n-3$	✓value of a ✓ $-2=\frac{1}{2}+b+c$ ✓ $0=2+2b+c$ ✓value of b ✓ value of c (5)
	OR/*OF* $T_n=T_1+(n-1)d_1+\frac{(n-1)(n-2)}{2}d_2$ $=-2+(n-1)(2)+\frac{(n-1)(n-2)}{2}(1)$ $=-2+2n-2+(n^2-3n+2)(\frac{1}{2})$ $=-2+2n-2+\frac{1}{2}n^2-\frac{3}{2}n+1$ $=\frac{1}{2}n^2+\frac{1}{2}n-3$	✓formula ✓substitution ✓ value of a ✓value of b ✓ value of c (5)
	OR/*OF* $2a=1$ $a=\frac{1}{2}$ $3a+b=T_2-T_1$ $3\left(\frac{1}{2}\right)+b=2$ $b=\frac{1}{2}$ $T_0=c=-3$ $\therefore T_n=\frac{1}{2}n^2+\frac{1}{2}n-3$	✓value of a ✓ $3\left(\frac{1}{2}\right)+b=2$ ✓value of b ✓ $T_0=c$ ✓ value of c (5)
	OR/*OF*	

	Since $T_2 = 0, (n-2)$ is a factor of T_n $T_n = an^2 + bn + c$ $= a(n-2)(n-k)$ $T_1 = -2 = a(1-2)(1-k)$ $-2 = -a(1-k)$ $a = \frac{2}{1-k}$ $T_3 = 3 = a(3-2)(3-k)$ $3 = a(3-k)$ $a = \frac{3}{3-k}$ $\frac{2}{1-k} = \frac{3}{3-k}$ $2(3-k) = 3(1-k)$ $6-2k = 3-3k$ $k = -3$ $a = \frac{1}{2}$ $T_n = \frac{1}{2}(n-2)(n+3)$ $= \frac{1}{2}n^2 + \frac{1}{2}n - 3$	✓ $T_n = a(n-2)(n-k)$ ✓ $-2 = a(1-2)(1-k)$ ✓ $3 = a(3-2)(3-k)$ ✓value of k ✓value of a (5)
2.1.3	$\frac{1}{2}n^2 + \frac{1}{2}n - 3 = 322$ $n^2 + n - 6 = 644$ $n^2 + n - 650 = 0$ $n = \frac{-1 \pm \sqrt{1^2 - 4(1)(650)}}{2}$ $n = 25$ or $n = -26$ The 25th term has a value of 322./*Die 25ste term se waarde is 322.* **OR/*OF*** $\frac{1}{2}n^2 + \frac{1}{2}n - 3 = 322$ $n^2 + n - 6 = 644$ $n^2 + n - 650 = 0$ $(n-25)(n+26) = 0$ $n = 25$ or $n = -26$ The 25th term has a value of 322./*Die 25ste term se waarde is 322.* **OR/*OF***	✓ $\frac{1}{2}n^2 + \frac{1}{2}n - 3 = 322$ ✓standard form ✓substitution into quadratic formula ✓answer (4) ✓ $\frac{1}{2}n^2 + \frac{1}{2}n - 3 = 322$ ✓standard form ✓factors ✓answer (4)

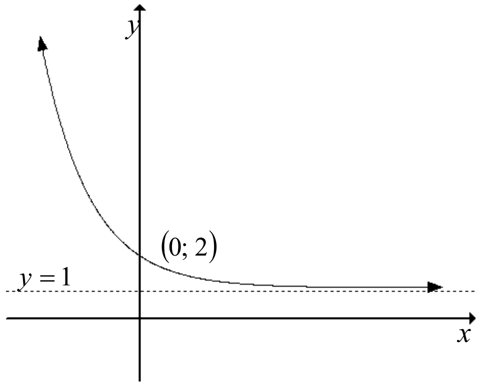
	$\frac{1}{2}n^2+\frac{1}{2}n-3=322$ $n^2+n-6=644$ $(n+3)(n-2)=23\times 28$ $n-2=23$ $n=25$	✓ $\frac{1}{2}n^2+\frac{1}{2}n-3=322$ ✓ $(n+3)(n-2)$ ✓ 23×28 ✓answer (4)
2.2.1	T_2 : $a+d=8$ T_5 : $a+4d=10$ T_5-T_2 : $3d=2$ $d=\frac{2}{3}$	✓ $a+d=8$ ✓ $a+4d=10$ ✓answer (3)
2.2.2	$T_1=T_2-d$ $=8-\frac{2}{3}$ $=\frac{22}{3}$ $T_n=a+(n-1)d$ $=\frac{22}{3}+(n-1)\frac{2}{3}$ $=\frac{2n+20}{3}$ $S_{50}=\sum_{n=1}^{50}\left(\frac{22}{3}+(n-1)\frac{2}{3}\right)$ **OR/*OF*** $S_{50}=\sum_{n=1}^{50}\left(\frac{2n+20}{3}\right)$	✓ $T_1=\frac{22}{3}$ ✓answer (2) (2)
2.2.3	$S_n=\frac{n}{2}[2a+(n-1)d]$ $S_{50}=\frac{50}{2}\left[2\left(\frac{22}{3}\right)+(50-1)\left(\frac{2}{3}\right)\right]$ $=\frac{3550}{3}$	✓correct substitution into correct formula ✓✓answer (3) **[18]**

QUESTION/*VRAAG* 3

3.1	$r=\frac{70}{100}$ $=\frac{7}{10}$ $T_n=ar^{n-1}$ $11{,}76=100\left(\frac{7}{10}\right)^{n-1}$ $\left(\frac{7}{10}\right)^{n-1}=\frac{11{,}76}{100}$ $n-1=\log_{\frac{7}{10}}\left(\frac{11{,}76}{100}\right)$ $n-1=6$ $n=7$ During the 7th year/*In die 7de jaar*	✓value of r ✓substitution in formula for T_n ✓use of logarithms ✓answer (4)
	OR/*OF*	
	$r=\frac{70}{100}$ $=\frac{7}{10}$ $T_n=ar^{n-1}$ $11{,}76=100(0{,}7)^{n-1}$ $0{,}7^{n-1}=\frac{11{,}76}{100}$ $=0{,}1176$ $(n-1)\log 0{,}7=\log 0{,}1176$ $n-1=\frac{\log 0{,}1176}{\log 0{,}7}$ $n-1=6$ $n=7$ During the 7th year/*In die 7de jaar*	✓value of r ✓substitution in formula for T_n ✓use of logarithms ✓answer (4)
3.2	$h(n)=130+(100+70+49+\ldots\text{to } n \text{ terms})$ $=130+\frac{100\left(1-(0{,}7)^n\right)}{1-0{,}7}$ $=130+\frac{100\left(1-(0{,}7)^n\right)}{0{,}3}$	✓130 ✓ $100+70+49+\ldots$to n terms ✓answer (3)

3.3	Eventual height of the tree/*Uiteindelike hoogte van die boom* $=130+\dfrac{100}{1-0{,}7}$ $=463{,}33$ mm OR $\dfrac{1390}{3}$ mm	✓✓ $130+\dfrac{100}{1-0{,}7}$ ✓answer (3) **[10]**

QUESTION/*VRAAG* 4

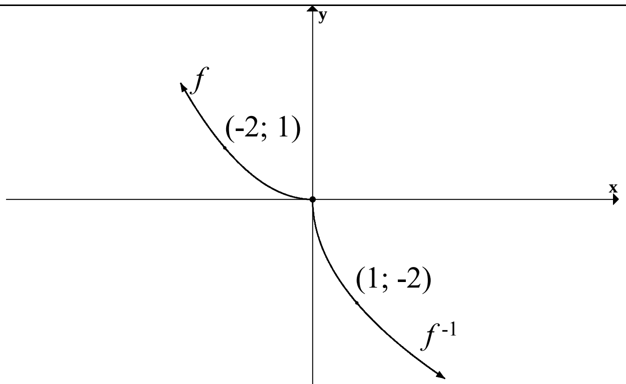
4.1	$(0\ ;2)$	✓answer (1)
4.2		✓shape ✓ $(0;2)$ ✓asymptote (3)
4.3	$f(-2)=5$ $f(1)=2^{-1}+1=\dfrac{3}{2}$ Average gradient $=\dfrac{f(1)-f(-2)}{1-(-2)}$ $=\dfrac{\frac{3}{2}-5}{3}$ $=-\dfrac{7}{6}$	✓ $f(-2)=5$ ✓ $f(1)=\dfrac{3}{2}$ ✓ answer (3)
4.4	Since the asymptote of f is $y=1$, the asymptote of $h(x)=3f(x)$ will be $y=3$. *Omdat die asimptoot van f* $y=1$ *is,* *sal die asimptoot van* $h(x)=3f(x)$ $y=3$ *wees.*	✓answer (1) **[8]**

QUESTION/*VRAAG* 5

5.1	$y = a(x+p)^2 + q$ Turning point $(1\,;-8)$: $y = a(x-1)^2 - 8$ Substitute $(0\,;-4)$: $-4 = a(0-1)^2 - 8$ $-4 = a - 8$ $a = 4 \quad p = -1 \quad q = -8$ $y = 4(x-1)^2 - 8$	✓ $y = a(x-1)^2 - 8$ ✓substitute (0;–4) ✓ $a = 4$ ✓ p and q values (4)
5.2	Asymptote is $y = -2 \quad \Rightarrow \quad d = -2$ Substitute $(1;-8)$: $-8 = \frac{k}{1+r} - 2$ $k = -6(1+r)$ $k = -6-6r$ ……………….line 1 Substitute $(0;-4)$: $-4 = \frac{k}{r} - 2$ $\frac{k}{r} = -2$ $k = -2r$ ………..………line 2 Equating lines 1 and 2: $-6-6r = -2r$ $-4r = 6$ $r = -\frac{3}{2}$ Substituting into line 2 or line 1: $k = (-2)\left(-\frac{3}{2}\right) = 3$ $\qquad k = -6-6\left(-\frac{3}{2}\right) = 3$	✓ $d = -2$ ✓ $k = -6-6r$ ✓ $k = -2r$ ✓ $-6-6r = -2r$ ✓ value of r ✓ value of k (6)
5.3	$g(x) \geq f(x)$ $\therefore 0 \leq x \leq 1$	✓ $0 \leq x$ ✓ $x \leq 1$ (2)
5.4	The line $y = k$ must pass through f twice on the positive side of the x-axis./*Die lyn y = k moet twee keer deur f aan die positiewe kant van die x-as sny.* $-8 < k < -4$	✓ $-8 < k$ ✓ $k < -4$ (2)

5.5	$y=-x+c$ Substitute the intersection point of the asymptotes, i.e. $\left(\frac{3}{2};-2\right)$: *Vervang die snypunt van die asimptote, m.a.w.* $\left(\frac{3}{2};-2\right)$: $-2=-\frac{3}{2}+c$ $c=-\frac{1}{2}$ $y=-x-\frac{1}{2}$	✓ $y=-x+c$ ✓ $-2=-\frac{3}{2}+c$ ✓answer (3)
	OR/*OF*	
	$y=-x$ is translated $\frac{3}{2}$ units right and 2 units down/ $y=-x$ *transleer* $\frac{3}{2}$ *eenhede na regs en 2 eenhede na onder* $\Rightarrow$ $y=-\left(x-\frac{3}{2}\right)-2$ $y=-x-\frac{1}{2}$	✓ $y=-x$ ✓ $y=-\left(x-\frac{3}{2}\right)-2$ ✓answer (3)
5.6	By symmetry, $Q=\left(\frac{3}{2}+8-2;\ -2+\frac{3}{2}-1\right)$ $=\left(\frac{15}{2};-\frac{3}{2}\right)$	✓ $x=\frac{15}{2}$ ✓ $y=-\frac{3}{2}$ (2) **[19]**

QUESTION/*VRAAG* 6

6.1	$f: \quad y = \frac{1}{4}x^2$ $f^{-1}: \quad x = \frac{1}{4}y^2$ $y^2 = 4x$ $y = \pm\sqrt{4x}$ $f^{-1}(x) = -\sqrt{4x}$ **OR**/OF $f^{-1}(x) = -2\sqrt{x}$	✓interchanging x and y ✓ $y^2 = 4x$ ✓answer (3)
6.2		✓both graphs pass through (0 ; 0) ✓shape for both ✓one additional point on both graphs (3)
6.3	Yes. No value of x in the domain of f^{-1} maps onto more than one y-value. *Ja. Geen waarde van x in die definisieversameling van* f^{-1} *assosieer met meer as een y-waarde nie.* **OR/*OF*** Yes. One to one function./*Ja. Een-tot-een-funksie.* **OR/*OF*** Yes. Vertical line test holds./*Ja. Die vertikale lyntoets werk.*	✓yes ✓reason (2) ✓yes ✓reason (2) ✓yes ✓reason (2) **[8]**

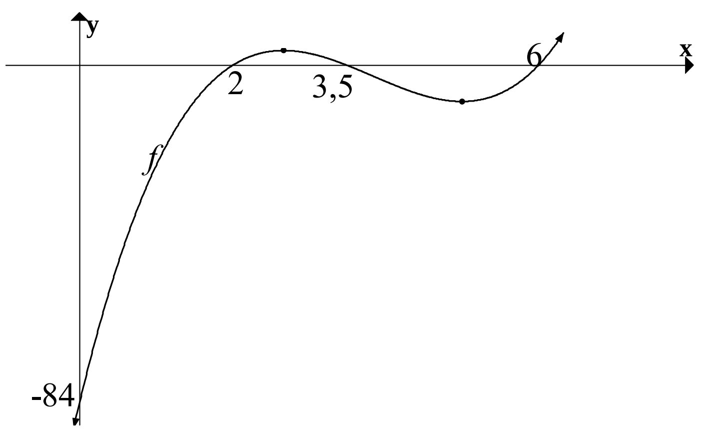
QUESTION/*VRAAG* 7

7.1.1	Quarterly interest rate/*Kwartaallikse rentekoers* $=\frac{10\%}{4}$ $=2,5\%$	✓answer (1)
7.1.2	$A=P(1+i)^n$ $=5000\left(1+\frac{2,5}{100}\right)^{2\times 4}$ $=\text{R}6\,092,01$	✓$n=8$ ✓ $5000\left(1+\frac{2,5}{100}\right)^{2\times 4}$ ✓answer (3)
7.2.1	$P_v=\frac{x\left[1-(1+i)^{-n}\right]}{i}$ $800\,000=\frac{10\,000\left[1-\left(1+\frac{0,14}{12}\right)^{-n}\right]}{\frac{0,14}{12}}$ $\frac{800\,000}{10\,000}\times\frac{0,14}{12}=1-\left(1+\frac{0,14}{12}\right)^{-n}$ $\left(1+\frac{0,14}{12}\right)^{-n}=1-\frac{800\,000}{10\,000}\times\frac{0,14}{12}$ $-n=\frac{\log\left[1-\frac{800000\times\frac{0,14}{12}}{10000}\right]}{\log\left(1+\frac{0,14}{12}\right)}$ $n=233,4699962$ Motloi can make 233 withdrawals of R10 000./*Motloi kan 233 onttrekkings van R10 000 maak.*	✓ $i=\frac{0,14}{12}$ ✓substitute into present value formula ✓ $\left(1+\frac{0,14}{12}\right)^{-n}=1-\frac{800\,000}{10\,000}\times\frac{0,14}{12}$ ✓ use of logs ✓233 (5)
7.2.2 (a)	$\text{A - F}_\text{v}=800\,000\left(1+\frac{0,14}{12}\right)^{48}-\frac{10\,000\left[\left(1+\frac{0,14}{12}\right)^{48}-1\right]}{\frac{0,14}{12}}$ $=1\ 396\ 005,54 - 638\ 577,36$ $=\text{R}757\,428$ **OR/*OF***	✓$n=48$ in both formulae ✓ $i=\frac{0,14}{12}$ in both formulae ✓ substitution into both formulae ✓answer (4)

	$P_v = \dfrac{x\left[1-(1+i)^{-n}\right]}{i}$ $= \dfrac{10000\left[1-\left(1+\frac{0,14}{12}\right)^{-185,4699962...}\right]}{\frac{0,14}{12}}$ $= \text{R}757\,428$	✓$n = -185,46996\ldots$ ✓$i = \dfrac{0,14}{12}$ ✓ $\dfrac{10000\left[1-\left(1+\frac{0,14}{12}\right)^{-185,4699962...}\right]}{\frac{0,14}{12}}$ ✓answer (4)
7.2.2 (b)	Let the purchase price of the house be *y*./*Laat die koopprys van die huis y wees.* $\dfrac{757\ 428}{y} = 30\%$ $757\ 428 = 0,3y$ $y = \dfrac{757\ 428}{0,3}$ $= \text{R}2\ 524\ 760$ **OR/*OF*** Let the purchase price of the house be *y*./*Laat die koopprys van die huis y wees.* $y = \dfrac{757\ 428}{30} \times 100$ $= \text{R}2\ 524\ 760$	✓answer (1) ✓answer (1) **[14]**

QUESTION/*VRAAG* 8

8.1	$f(x+h) = -(x+h)^2 + 4 = -(x^2 + 2xh + h^2) + 4$ $= -x^2 - 2xh - h^2 + 4$ $f(x+h) - f(x) = -2xh - h^2$ $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \to 0} \frac{-2xh - h^2}{h}$ $= \lim_{h \to 0} \frac{h(-2x - h)}{h}$ $= \lim_{h \to 0} (-2x - h)$ $= -2x$ **OR/*OF*** $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \to 0} \frac{-(x+h)^2 + 4 - (-x^2 + 4)}{h}$ $= \lim_{h \to 0} \frac{-x^2 - 2xh - h^2 + 4 + x^2 - 4}{h}$ $= \lim_{h \to 0} \frac{-2xh - h^2}{h}$ $= \lim_{h \to 0} \frac{h(-2x - h)}{h}$ $= \lim_{h \to 0} (-2x - h)$ $= -2x$	✓ finding $f(x+h)$ ✓ $-2xh - h^2$ ✓formula ✓factorisation ✓answer (5) ✓formula ✓ finding $f(x+h)$ ✓ $-2xh - h^2$ ✓factorisation ✓answer (5)
8.2.1	$y = 3x^2 + 10x$ $\frac{dy}{dx} = 6x + 10$	✓ $6x$ ✓ 10 (2)
8.2.2	$f(x) = \left(x - \frac{3}{x}\right)^2$ $= x^2 - 6 + \frac{9}{x^2}$ $= x^2 - 6 + 9x^{-2}$ $f'(x) = 2x - 18x^{-3}$	✓ $x^2 - 6 + \frac{9}{x^2}$ ✓ $9x^{-2}$ ✓ $2x - 18x^{-3}$ (3)

8.3.1	$f(2) = 2(2)^3 - 23(2)^2 + 80(2) - 84$ $= 0$ $\therefore (x-2)$ is a factor	✓substitution of 2 into f ✓value of 0 (2)
8.3.2	$f(x) = 2x^3 - 23x^2 + 80x - 84$ $= (x-2)(2x^2 - 19x + 42)$ $= (x-2)(2x-7)(x-6)$	✓ $2x^2 - 19x + 42$ ✓ $(x-2)(2x-7)(x-6)$ (2)
8.3.3	$f'(x) = 6x^2 - 46x + 80$ $6x^2 - 46x + 80 = 0$ $3x^2 - 23x + 40 = 0$ $(3x-8)(x-5) = 0$ $x = \frac{8}{3}$ or $x = 5$	✓ $f'(x) = 6x^2 - 46x + 80$ ✓ $f'(x) = 0$ ✓factors ✓x-values (4)
8.3.4		✓x-intercepts ✓y-intercept ✓shape (3)
8.3.5	$6x^2 - 46x + 80 = 40$ $6x^2 - 46x + 40 = 0$ $3x^2 - 23x + 20 = 0$ $(3x-20)(x-1) = 0$ $x = \frac{20}{3}$ or $x = 1$ But x must be an integer, so $x = 1$ at the point where tangent touches f /*x moet heelgetal wees so x = 1 by punt waar die raaklyn f raak:* $y = f(1) = 2(1)^3 - 23(1)^2 + 80(1) - 84 = -25$ $y = mx + c$ $-25 = 40(1) + c$ $-65 = c$ $(0; -65)$	✓ $6x^2 - 46x + 80 = 40$ ✓factors ✓$x = 1$ ✓ y-value ✓ $-25 = 40(1) + c$ ✓answer (6) **[27]**

QUESTION/*VRAAG* 9

9.1	$340 = \pi r^2 h$ $\therefore h = \dfrac{340}{\pi r^2}$	✓substitution into volume formula ✓answer (2)
9.2	$A = 2\pi r^2 + 2\pi rh$ $= 2\pi r^2 + 2\pi r\left(\dfrac{340}{\pi r^2}\right)$ $= 2\pi r^2 + 680r^{-1}$	✓formula ✓substitution of *h* (2)
9.3	$A(r) = 2\pi r^2 + 680r^{-1}$ $A'(r) = 4\pi r - 680r^{-2}$ $4\pi r - 680r^{-2} = 0$ $4\pi r = \dfrac{680}{r^2}$ $r^3 = \dfrac{680}{4\pi}$ $r = \sqrt[3]{\dfrac{680}{4\pi}}$ cm or $3{,}78$ cm	✓ $4\pi r$ ✓ $-680r^{-2}$ ✓ $r^3 = \dfrac{680}{4\pi}$ ✓answer (4) **[8]**

QUESTION/*VRAAG* 10

10.1.1	160	✓answer (1)
10.1.2	$P(M) = \dfrac{60}{160}$ $= \dfrac{3}{8}$ $= 0{,}375$	✓60 ✓answer (2)
10.1.3	$P(Male) \times P(Coffee) = P(Male\ and\ Coffee)$ $P(Manlik) \times P(Koffie) = P(Manlik\ en\ Koffie)$ $\dfrac{3}{8} \times \dfrac{80}{160} = \dfrac{b}{160}$ $\dfrac{3}{16} = \dfrac{b}{160}$ $16b = 480$ $b = 30$	✓formula ✓ $\dfrac{80}{160}$ ✓ $\dfrac{b}{160}$ ✓ answer (4)

10.2.1	$6!$ $= 6 \times 5 \times 4 \times 3 \times 2 \times 1$ $= 720$	✓$6!$ ✓answer (2)
10.2.2	number of ways Xoliswa sits next to Anees/ *getal maniere waarop Xoliswa langs Anees sit* $= 5! \times 2$ $= 240$ **OR/*OF*** Regard Xoliswa and Anees as a single entity/*Beskou Xoliswa en Anees as een* Number of ways in which 5 passengers can be arranged = 5! *Getal maniere waarop 5 passasiers gerangskik kan word* = 5! So 5! different arrangements for XA and 5! different arrangements for AX *So 5! verskillende rangskikkings vir XA en 5! verskillende rangskikkings vir AX* number of ways Xoliswa sits next to Anees *getal maniere waarop Xoliswa langs Anees sit* $= 5! \times 2$ $= 240$	✓ $5! \times 2$ ✓answer (2) ✓ $5! + 5!$ ✓answer (2)
10.2.3	number of ways Mary is at an end of the row on the left $= 1 \times 5!$ number of ways Mary is at an end of the row on the right $= 5! \times 1$ total number of arrangements $= 6!$ $P(\text{Mary is at an end of the row}) = \frac{5! \times 1 + 1 \times 5!}{6!}$ $= \frac{1}{3}$ *getal maniere waarop Mary aan die einde van die ry links is* $= 1 \times 5!$ *getal maniere waarop Mary aan die einde van die ry regs is* $= 5! \times 1$ *totale getal rangskikkings* $= 6!$ $P(\text{Mary is } \textit{aan einde van die ry}) = \frac{5! \times 1 + 1 \times 5!}{6!}$ $= \frac{1}{3}$	✓both LHS and RHS ways ✓$6!$ ✓setting up probability ✓answer (4) **[15]**
	TOTAL/*TOTAAL*:	**150**