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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL
SENIOR CERTIFICATE/
NASIONALE SENIOR
SERTIFIKAAT

GRADE 12/*GRAAD* 12

MATHEMATICS P1/*WISKUNDE V1*

FEBRUARY/MARCH/*FEBRUARIE/MAART* 2018

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 17 pages./
Hierdie nasienriglyne bestaan uit 17 bladsye.

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

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

QUESTION/*VRAAG* 1

1.1.1	$x^2 - 6x - 16 = 0$ $(x-8)(x+2) = 0$ $\qquad x = -2$ or $x = 8$	✓ factors ✓ $x = -2$ ✓ $x = 8$ $\qquad$ (3)
1.1.2	$2x^2 + 7x - 1 = 0$ $\qquad x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $\qquad = \dfrac{-(7) \pm \sqrt{(7)^2 - 4(2)(-1)}}{2(2)}$ $\qquad = \dfrac{-7 \pm \sqrt{57}}{4}$ $\quad x = 0{,}14$ or $x = -3{,}64$ **OR/*OF*** $\boxed{\begin{array}{l}\text{NOTE: Penalise 1 mark if the}\\\text{rounding to TWO decimal}\\\text{places is incorrect.}\end{array}}$ $x^2 + \dfrac{7}{2}x + \dfrac{49}{16} = \dfrac{1}{2} + \dfrac{49}{16}$ $\left(x + \dfrac{7}{4}\right)^2 = \dfrac{57}{16}$ $x + \dfrac{7}{4} = \pm\dfrac{\sqrt{57}}{4}$ $x = \dfrac{-7 \pm \sqrt{57}}{4}$ $\quad x = 0{,}14$ or $x = -3{,}64$	✓subs into correct formula ✓$\dfrac{-7 \pm \sqrt{57}}{4}$ ✓ $x = 0{,}14$ ✓ $x = -3{,}64$ **OR/*OF*** ✓for adding $\dfrac{49}{16}$ on both sides ✓$\dfrac{-7 \pm \sqrt{57}}{4}$ ✓ $x = 0{,}14$ ✓ $x = -3{,}64$ $\qquad$ (4)
1.2	$x^2 - 25 < 0$ $(x-5)(x+5) < 0$ $-5 < x < 5$ $x = \{-4 ; -3 ; -2 ; -1 ; 0 ; 1 ; 2 ; 3 ; 4\}$ $\boxed{\begin{array}{l}\text{NOTE:}\\\text{Final answer only}\\ 2 / 2\end{array}}$	✓factors ✓✓inequality ✓answer $\qquad$ (4)

1.3	$x = 2y - 1$	$\checkmark$ $x = 2y - 1$
	$(2y-1)^2 - 7 - y^2 = -y$	$\checkmark$ substitution
	$4y^2 - 4y + 1 - 7 - y^2 = -y$	
	$3y^2 - 3y - 6 = 0$	
	$y^2 - y - 2 = 0$	$\checkmark$ correct standard form
	$(y-2)(y+1) = 0$	$\checkmark$ factors
	$y = 2$ or $y = -1$	$\checkmark$ y – values
	$x = 2(2) - 1$ or $x = 2(-1) - 1$	
	$x = 3$ or $x = -3$	$\checkmark$ x – values
	OR/*OF*	**OR/*OF***
	$y = \dfrac{x+1}{2}$	$\checkmark$ $y = \dfrac{x+1}{2}$
	$x^2 - 7 - y^2 = -y$	
	$x^2 - 7 - \left(\dfrac{x+1}{2}\right)^2 = -\left(\dfrac{x+1}{2}\right)$	$\checkmark$ substitution
	$x^2 - 7 - \left(\dfrac{x^2 + 2x + 1}{4}\right) = \dfrac{-x-1}{2}$	
	$4x^2 - 28 - x^2 - 2x - 1 = -2x - 2$	
	$3x^2 - 27 = 0$	$\checkmark$ correct standard form
	$x^2 - 9 = 0$	
	$(x-3)(x+3) = 0$	$\checkmark$ factors
	$x = -3$ or $x = 3$	$\checkmark$ x – values
	$y = \dfrac{-3+1}{2}$ or $y = \dfrac{3+1}{2}$	
	$y = -1$ or $y = 2$	$\checkmark$ y – values (6)
1.4	$\dfrac{3^{2018} + 3^{2016}}{3^{2017}}$	
	$= \dfrac{3^{2017}\left(3^1 + 3^{-1}\right)}{3^{2017}}$	$\checkmark$ common factor 3^{2017}
	$= 3 + \dfrac{1}{3}$	
	$= 3\dfrac{1}{3}$ or $\dfrac{10}{3}$	$\checkmark$ answer
	OR/*OF*	**OR/*OF***

	$$\frac{3^{2018}+3^{2016}}{3^{2017}}$$ $$=\frac{3^{2016}\left(3^2+1\right)}{3^{2017}}$$ $$=\frac{10}{3}$$ **OR/OF** $$\frac{3^{2018}+3^{2016}}{3^{2017}}$$ $$=\frac{3^{2018}}{3^{2017}}+\frac{3^{2016}}{3^{2017}}$$ $$=3+\frac{1}{3}$$ $$=3\frac{1}{3} \text{ or } \frac{10}{3}$$	✓ common factor 3^{2016} ✓ answer **OR/OF** ✓ dividing by 3^{2017} ✓ answer (2)
1.5.1	$3x-5\ge 0$ and $x\ne 3$ $x\ge\dfrac{5}{3}$ and $x\ne 3$	✓ $3x-5\ge 0$ ✓ $x\ge\dfrac{5}{3}$ ✓ $x\ne 3$ (3)
1.5.2	$$\frac{\sqrt{3x-5}}{x-3}=1$$ $$\sqrt{3x-5}=x-3$$ $$3x-5=(x-3)^2$$ $$3x-5=x^2-6x+9$$ $$x^2-9x+14=0$$ $$(x-7)(x-2)=0$$ $$x\ne 2 \text{ or } x=7$$ NOTE: If $x=2$ is not rejected, then maximum 3 / 4 marks	✓ $\sqrt{3x-5}=x-3$ ✓ $3x-5=(x-3)^2$ ✓ factors ✓ $x=7$ (4) **[26]**

QUESTION/*VRAAG* 2

2.1.1	$30 ; 10 ; \dfrac{10}{3} \dots$	$\checkmark r = \dfrac{1}{3}$
	$a = 30 \qquad r = \dfrac{1}{3}$	
	$T_n = ar^{n-1}$	
	$\dfrac{10}{729} = 30\left(\dfrac{1}{3}\right)^{n-1}$	$\checkmark$ substitution into correct formula
	$\dfrac{1}{2187} = 3^{1-n} \qquad\qquad \dfrac{1}{2187} = \left(\dfrac{1}{3}\right)^{n-1}$	
	$3^{-7} = 3^{1-n} \qquad$ **OR/*OF*** $\qquad \left(\dfrac{1}{3}\right)^{7} = \left(\dfrac{1}{3}\right)^{n-1}$	$\checkmark\ 3^{-7} = 3^{1-n}$ or $\left(\dfrac{1}{3}\right)^{7} = \left(\dfrac{1}{3}\right)^{n-1}$ or
	$-7 = 1-n \qquad\qquad\qquad\qquad 7 = n-1$	use of logs
	$n = 8 \qquad\qquad\qquad\qquad\qquad n = 8$	$\checkmark\ n = 8$
		(4)
2.1.2	$S_\infty = \dfrac{a}{1-r}$	
	$= \dfrac{30}{1-\dfrac{1}{3}}$	$\checkmark$ substitution into correct formula
	$= 45$	$\checkmark$ answer
		(2)
2.2	$S_n = a + (a+d) + \dots + (a+(n-2)d) + (a+(n-1)d) \quad (1)$	$\checkmark$ expanding S_n
	$S_n = (a+(n-1)d) + (a+(n-2)d) + \dots + (a+d) + a \quad (2)$	$\checkmark$ reverse writing
	Adding both equations/*Tel die twee vergelykings bymekaar:*	
	$2S_n = 2a+(n-1)d + 2a+(n-1)d + 2a+(n-1)d + \dots$	
	$\qquad = n[2a+(n-1)d]$	$\checkmark\ 2S_n = n[2a+(n-1)d]$
	$\quad S_n = \dfrac{n}{2}[2a+(n-1)d]$	$\checkmark\ S_n = \dfrac{n}{2}[2a+(n-1)d]$
		(4)
	OR/*OF*	
	$S_n = a + (a+d) + \dots + (a+(n-2)d) + T_n \qquad\qquad (1)$	$\checkmark$ expanding S_n
	$S_n = T_n + (T_n - d) + (T_n - 2d) + \dots + a \qquad (2)$	$\checkmark$ reverse writing
	Adding both equations/*Tel die twee vergelykings bymekaar:*	
	$2S_n = (a+T_n) + (a+T_n) + (a+T_n) + \dots + (a+T_n)$	$\checkmark\ 2S_n = n(a+T_n)$
	$\quad S_n = \dfrac{n}{2}(a+T_n)$	
	but $Tn = a+(n-1)d$	
	$\quad S_n = \dfrac{n}{2}[2a+(n-1)d]$	$\checkmark\ S_n = \dfrac{n}{2}[2a+(n-1)d]$
		(4)
		[10]

QUESTION/*VRAAG* 3

3.1	$-1\ ;\ 2\ ;\ 5$ $T_n = -1 + (n-1)(3)$ $\quad = 3n - 4$	✓ $3n$ ✓ -4 (2)

3.2	$T_{43} = 3(43) - 4$ **OR/ OF** $T_{43} = -1 + (43-1)(3)$
	 $\quad\quad = 125$ $= 125$
	                            NOTE:
	                          Answer only 2 / 2
		✓ subs of 43
		 ✓ answer
		
		 (2)

3.3	$T_n = 3n - 4$ $S_n = \sum\limits_{k=1}^{n} T_k = -1 + 2 + 5 + \ldots\ldots\ldots + 3n - 4$ $S_n = \dfrac{n}{2}\left[-1 + 3n - 4\right]$ or $S_n = \dfrac{n}{2}\left[-2 + (n-1)3\right]$ $\quad = \dfrac{n}{2}\left[3n - 5\right]$ $\quad = \dfrac{3n^2 - 5n}{2}$ **OR/*OF*** $\quad T_n = 3n - 4$ $\sum\limits_{k=1}^{n} T_k = 3(1) - 4 + 3(2) - 4 + 3(3) - 4 + \ldots\ldots + 3n - 4$ $\quad = 3(1 + 2 + 3 + \ldots\ldots + n) - 4n$ $\quad = \dfrac{3n(n+1)}{2} - 4n$ $\quad = \dfrac{3n^2 - 5n}{2}$	✓ $S_n = \sum\limits_{k=1}^{n} T_k$ ✓ substitution into correct formula ✓ $\dfrac{n}{2}\left[3n - 5\right]$ or $\dfrac{3n^2 - 5n}{2}$ **OR/*OF*** ✓ $(1) - 4 + 3(2) - 4 + 3(3) - 4 + \ldots\ldots + 3n - 4$ ✓ $3(1 + 2 + 3 + \ldots\ldots + n) - 4n$ ✓ $\dfrac{3n^2 - 5n}{2}$ (3)
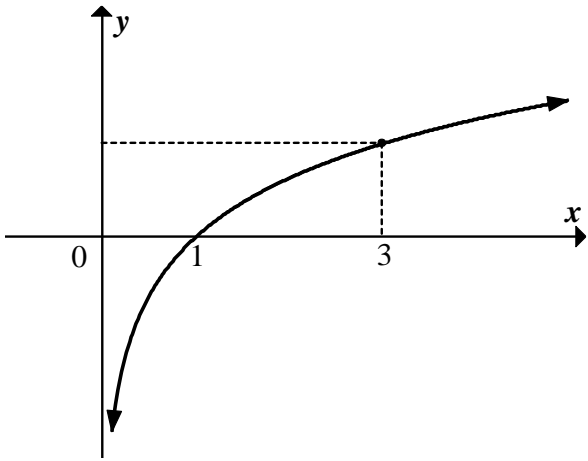
3.4	$T_{11} = (T_{11} - T_{10}) + (T_{10} - T_9) + (T_9 - T_8) + \ldots + (T_3 - T_2) + (T_2 - T_1) + T_1$	$\checkmark\checkmark$ generating sum
	$125 = 29 + 26 + 23 + \ldots 2 + T_1$	$\checkmark$ $29 + 26 + 23 + \ldots 2$
	$\quad = \dfrac{10}{2}(29 + 2) + T_1$	$\checkmark$ $\dfrac{10}{2}(29 + 2)$
	$\quad = 155 + T_1$	$\checkmark$ 155
	$T_1 = -30$	$\checkmark$ -30
	NOTE: Answer only 1 / 6 If they only use $3n - 4$ breakdown 0 / 6	
	OR/*OF*	**OR/*OF***
	$T_n = an^2 + bn + c$	
	$\therefore T_{11} = 121a + 11b + c = 125$	
	$T_n - T_{n-1} = an^2 + bn + c - \left[a(n-1)^2 + b(n-1) + c \right]$	
	$= an^2 + bn + c - an^2 + 2an - a - bn + b - c$	
	$= 2an + b - a$	$\checkmark$ $121a + 11b + c = 125$
	$T_n - T_{n-1} = 3n - 4$	
	$2a = 3 \qquad$ and $\; b - a = -4$	$\checkmark$ calculating $T_n - T_{n-1}$ in terms of a, b and c
	$a = \dfrac{3}{2} \qquad$ and $\; b = -\dfrac{5}{2}$	
	$121a + 11b + c = 125$	$\checkmark$ $a = \dfrac{3}{2}$
	$121\left(\dfrac{3}{2}\right) + 11\left(-\dfrac{5}{2}\right) + c = 125$	$\checkmark$ $b = -\dfrac{5}{2}$
	$c = -29$	
	$T_n = \dfrac{3}{2}n^2 - \dfrac{5}{2}n - 29$	$\checkmark$ $c = -29$
	$T_1 = \dfrac{3}{2}(1)^2 - \dfrac{5}{2}(1) - 29$	
	$= -30$	$\checkmark$ -30
		(6)
		[13]

QUESTION/*VRAAG* 4

4.1	E(4 ; –9)	✓ $x = 4$ ✓ $y = -9$ (2)
4.2	$f(x) = (x-4)^2 - 9$ $(x-4)^2 - 9 = 0$ $(x-4)^2 = 9$ $x - 4 = \pm 3$ $x = 7 \quad$ or $\quad x = 1$ A(1 ; 0) **OR/*OF*** $f(x) = (x-4)^2 - 9$ $0 = x^2 - 8x + 16 - 9$ $0 = x^2 - 8x + 7$ $(x-7)(x-1) = 0$ $x = 7 \quad$ or $\quad x = 1$ A(1 ; 0)	✓ $y = 0$ ✓ $x - 4 = \pm 3$ ✓ A(1 ; 0) **OR/*OF*** ✓ $y = 0$ ✓ $(x-7)(x-1)$ ✓ A(1 ; 0) (3)
4.3	C$(0 ; 7)$ M$(8 ; 7)$ NOTE: Answer only 3 / 3	✓ C$(0 ; 7)$ ✓ $x = 8$ ✓ $y = 7$ (3)
4.4	C$(0 ; 7)$ D$(4 ; 0)$ $m = \dfrac{7-0}{0-4} \quad$ or $\quad m = \dfrac{0-7}{4-0} \quad$ or $\quad 0 = 4m + 7$ $m = -\dfrac{7}{4} \qquad m = -\dfrac{7}{4} \qquad m = -\dfrac{7}{4}$ $y - 0 = -\dfrac{7}{4}(x - 4)$ $y = -\dfrac{7}{4}x + 7$	✓ D$(4 ; 0)$ ✓ $m = -\dfrac{7}{4}$ ✓ $y = -\dfrac{7}{4}x + 7$ (3)
4.5	$g : y = -\dfrac{7}{4}x + 7$ $g^{-1} : x = -\dfrac{7}{4}y + 7$ $4x = -7y + 28$ $7y = -4x + 28$ $y = -\dfrac{4}{7}x + 4$ **OR/*OF***	 ✓ interchange x and y ✓ simplification ✓ $y = -\dfrac{4}{7}x + 4$ **OR/*OF***

	g^{-1} is the straight line through $(0\,;4)$ and $(7\,;0)$ $y = mx + 4$ $0 = 7m + 4$ $y = -\dfrac{4}{7}x + 4$	✓ straight line through $(0\,;4)$ and $(7\,;0)$ ✓ substitution ✓ $y = -\dfrac{4}{7}x + 4$ (3)
4.6	$x \cdot f(x) \le 0$ $\therefore x \le 0$ or $1 \le x \le 7$	✓✓ $x \le 0$ ✓✓ $1 \le x \le 7$ (4) **[18]**

QUESTION/*VRAAG* 5

5.1	$a^0 = 1$ T$(0\,;1)$	✓ $x = 0$ ✓ $y = 1$ (2)
5.2	$g(x) = a^x$ $9 = a^2$ $a = 3 \qquad a > 0$	✓ substitution ✓ $a = 3$ (2)
5.3	$y = \left(\dfrac{1}{3}\right)^x$ or $y = 3^{-x}$	✓✓ $y = \left(\dfrac{1}{3}\right)^x$ (2)
5.4	$3^0 < 3^{\log_3 x} < 3^1$ $1 < x < 3$ **OR** $1 < x < 3$	✓ $1 < x$ ✓ $x < 3$ (2) ✓ $1 < x$ ✓ $x < 3$ (2) **[8]**

QUESTION/*VRAAG* 6

6.1	$q = 1$	✓ $q = 1$ (1)
6.2	Subs $(0;0)$ $0 = \dfrac{a}{0+p} + 1$ $\dfrac{a}{p} = -1$ $a = -p$ Subs P: $\sqrt{2} + 1 = \dfrac{a}{\sqrt{2}+2+p} + 1$ $\sqrt{2} = \dfrac{a}{\sqrt{2}+2+p}$ $2 + 2\sqrt{2} + \sqrt{2}p = a$ $2 + 2\sqrt{2} = a - p\sqrt{2} = a + a\sqrt{2}$ $2(1+\sqrt{2}) = a(1+\sqrt{2})$ $a = 2$; $p = -2$ NOTE: Answer only 2 / 5	✓ $0 = \dfrac{a}{0+p} + 1$ ✓ $a = -p$ ✓ substitution ✓ $a = 2$ ✓ $p = -2$ (5)
6.3		✓ $y = 1$ ✓ $x = 2$ ✓ shape ✓ $(0 ; 0)$ (4) **[10]**

QUESTION/*VRAAG* 7

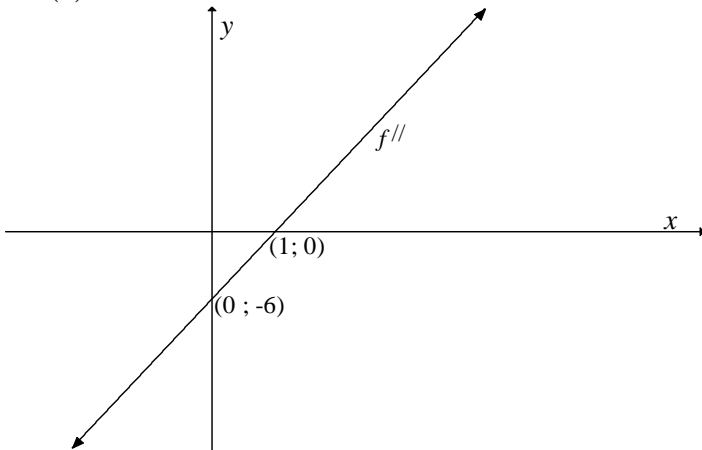| 7.1	$F = \dfrac{x\left[(1+i)^n - 1\right]}{i}$ $= \dfrac{2500\left[\left(1+\dfrac{0,06}{12}\right)^{60} - 1\right]}{\dfrac{0,06}{12}}$ $= R174\ 425,08$	✓ $n = 60$ and $i = \dfrac{0,06}{12} / 0,005$ ✓ correct substitution into correct formula ✓ answer (3)
7.2.1	After eleven months, Genevieve will owe/ *Na elf maande skuld Genevieve* $A = 82\ 000\left(1+\dfrac{0,15}{12}\right)^{11}$ $= R\ 94\ 006,79$	✓ $n = 11$ ✓ correct substitution into correct formula ✓ answer (3)
7.2.2	$P = \dfrac{x\left[1-(1+i)^{-n}\right]}{i}$ $94\ 006,79 = \dfrac{3\ 200\left[1-\left(1+\dfrac{0,15}{12}\right)^{-n}\right]}{\dfrac{0,15}{12}}$ $\dfrac{94\ 006,79}{3\ 200} \times \dfrac{0,15}{12} = 1-\left(1+\dfrac{0,15}{12}\right)^{-n}$ $\left(1+\dfrac{0,15}{12}\right)^{-n} = 1-0,3672147...$ $-n\log\left(1+\dfrac{0,15}{12}\right) = \log 0,6327852...$ $-n = -36,8382...$ $n = 36,84$ Genevieve will have to pay 36 installments of R3 200	✓ 94006,79 ✓ substitute into correct formula ✓correct use of logs (logs to be defined) ✓ $n = 36,84$ ✓ 36 installments (5)

7.2.3	$P = \dfrac{x\left[1-(1+i)^{-n}\right]}{i}$	$\checkmark n = -0,83826912$
	$= \dfrac{3200\left[1-\left(1+\dfrac{0,15}{12}\right)^{-0,83826912}\right]}{\dfrac{0,15}{12}}$	$\checkmark$ substitute into correct formula
	$P = 2652$	$\checkmark$ answer
	Outstanding balance after 36 installments is R2 652 Final payment will be: $A = 2\,652,00\left(1+\dfrac{0,15}{12}\right)^1$ $= R\ 2685,00$	$\checkmark\ 2\,652,00\left(1+\dfrac{0,15}{12}\right)^1$ $\checkmark$ answer
	OR/OF Balance : $94006,79\left(1+\dfrac{0,15}{12}\right)^{36} - \dfrac{3\,200\left[\left(1+\dfrac{0,15}{12}\right)^{36}-1\right]}{\dfrac{0,15}{12}}$ $= R2\ 651,72$	**OR/OF** $\checkmark\,94006,79\left(1+\dfrac{0,15}{12}\right)^{36}$ $\checkmark\ \dfrac{3\,200\left[\left(1+\dfrac{0,15}{12}\right)^{36}-1\right]}{\dfrac{0,15}{12}}$ $\checkmark\ 2\ 651,72$
	Final payment will be: $A = 2651,72\left(1+\dfrac{0,15}{12}\right)^1$ $= R\ 2\ 685,00$	$\checkmark\ 2651,72\left(1+\dfrac{0,15}{12}\right)^1$ $\checkmark$ answer (5) **[16]**

QUESTION/*VRAAG* 8

8.1	$f(x+h) = 4x^2$	$\checkmark 4(x+h)^2$
	$f(x+h) - f(x) = 4(x+h)^2 - 4x^2$	
	$\qquad = 4(x^2 + 2xh + h^2) - 4x^2$	
	$\qquad = 4x^2 + 8xh + 4h^2 - 4x^2$	$\checkmark 8xh + 4h^2$
	$\qquad = 8xh + 4h^2$	
	$f'(x) = \lim_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$	$\checkmark \dfrac{f(x+h) - f(x)}{h}$
	$\qquad = \lim_{h \to 0}\left[\dfrac{8xh + 4h^2}{h} \right]$	
	$\qquad = \lim_{h \to 0}\left[\dfrac{h(8x + 4h)}{h} \right]$	$\checkmark \dfrac{h(8x + 4h)}{h}$
	$\qquad = 8x$	$\checkmark 8x$
	OR/OF	**OR/OF**
	$f'(x) = \lim_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$	$\checkmark \dfrac{f(x+h) - f(x)}{h}$
	$\qquad = \lim_{h \to 0}\left[\dfrac{4(x+h)^2 - 4x^2}{h} \right]$	$\checkmark 4(x+h)^2$
	$\qquad = \lim_{h \to 0}\left[\dfrac{4x^2 8xh + 4h^2 - 4x^2}{h} \right]$	
	$\qquad = \lim_{h \to 0}\left[\dfrac{8xh + 4h^2}{h} \right]$	$\checkmark 8xh + 4h^2$
	$\qquad = \lim_{h \to 0}\left[\dfrac{h(8x + 4h)}{h} \right]$	$\checkmark \dfrac{h(8x + 4h)}{h}$
	$\qquad = 8x$	$\checkmark 8x$ (5)
8.2.1	$D_x\left[\dfrac{x^2 - 2x - 3}{x - 1} \right]$	
	$= D_x\left[\dfrac{(x-3)(x+1)}{x+1} \right]$	$\checkmark \dfrac{(x-3)(x+1)}{x+1}$
	$= D_x(x-3)$	$\checkmark (x-3)$
	$= 1$	$\checkmark 1$ (3)
8.2.2	$f(x) = \sqrt{x} = x^{\frac{1}{2}}$	$\checkmark x^{\frac{1}{2}}$
	$f'(x) = \dfrac{1}{2} x^{-\frac{1}{2}}$	$\checkmark \dfrac{1}{2} x^{-\frac{1}{2}}$
	$f''(x) = -\dfrac{1}{4} x^{-\frac{3}{2}}$	$\checkmark -\dfrac{1}{4} x^{-\frac{3}{2}}$
		(3)
		[11]

QUESTION/*VRAAG* 9

9.1	$f(x) = (x+2)(x-1)(x-4)$	$\checkmark\checkmark$ $f(x) = (x+2)(x-1)(x-4)$
	$= (x^2 + x - 2)(x-4)$	
	$= x^3 + x^2 - 2x - 4x^2 - 4x + 8$	$\checkmark$ expansion
	$= x^3 - 3x^2 - 6x + 8$	$\checkmark$ $x^3 - 3x^2 - 6x + 8$
	$b = -3 \; ; \; c = -6 \; ; \; d = 8$	(4)
9.2	$f(x) = x^3 - 3x^2 - 6x + 8$	
	$f^{/}(x) = 0$	$\checkmark$ $f^{/}(x) = 0$
	$3x^2 - 6x - 6 = 0$	
	$x^2 - 2x - 2 = 0$	$\checkmark$ $3x^2 - 6x - 6$
	$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	
	$= \dfrac{2 \pm \sqrt{(2)^2 - 4(1)(-2)}}{2(1)}$	$\checkmark$ substitution into correct formula
	$= \dfrac{2 \pm \sqrt{12}}{2}$	
	$x = -0{,}73$	$\checkmark$ $x = -0{,}73$ (4)
9.3	$f(x) = x^3 - 3x^2 - 6x + 8$	
	$f(-1) = (-1)^3 - 3(-1)^2 - 6(-1) + 8$ or $f(-1) = (1)(-2)(-5)$	
	$\qquad = 10 \qquad\qquad\qquad\qquad\qquad\qquad = 10$	$\checkmark$ $f(-1) = 10$
	$f^{/}(-1) = 3(-1)^2 - 6(-1) - 6$	$\checkmark$ $f^{/}(-1) = 3$
	$\qquad = 3$	$\checkmark$ substitution
	$y - 10 = 3(x+1)$	$\checkmark$ $y = 3x + 13$ (4)
	$y = 3x + 13$	
9.4	$f^{//}(x) = 6x - 6$	$\checkmark$ $f^{//}(x) = 6x - 6$ $\checkmark$ x- intercept $\checkmark$ y- intercept (3)

9.5	f concave upwards $f^{//}(x) > 0$ $6x - 6 > 0$ $x > 1$	NOTE: Answer only 2 / 2	✓ $f^{//}(x) > 0$ ✓ $x > 1$ (2) **[17]**

QUESTION/*VRAAG* 10

$$f(x) = -3x^3 + x$$

$$-9x^2 + 1 = 0$$

$$x = \frac{1}{3} \quad \text{or} \quad x = -\frac{1}{3}$$

Maximum of f will be at $x = \frac{1}{3}$

$$f\left(\frac{1}{3}\right) = -3\left(\frac{1}{3}\right)^3 + \left(\frac{1}{3}\right)$$

$$= \frac{2}{9}$$

Maximum of $f(x) + q$ will also be at $x = \frac{1}{3}$

$$f\left(\frac{1}{3}\right) + q = \frac{8}{9}$$

$$\frac{2}{9} + q = \frac{8}{9}$$

$$q = \frac{6}{9}$$

$$= \frac{2}{3}$$

For $f(x) + q$ to have a maximum of $\frac{8}{9}$ the value of q

has to be $\frac{2}{3}$.

Marking column:

✓ $-9x^2 + 1 = 0$

✓ $x = \frac{1}{3} \quad or \quad x = -\frac{1}{3}$

✓ Maximum at $x = \frac{1}{3}$

✓ $f\left(\frac{1}{3}\right) = \frac{2}{9}$

✓ $\frac{2}{9} + q = \frac{8}{9}$

✓ $q = \frac{2}{3}$

[6]

QUESTION/*VRAAG* 11

11.1.1	Let the event Veli arrive late for school be V. Let the event Bongi arrive late for school be B. / *Laat V die gebeurtenis wees dat Veli Laat B die gebeurtenis wees dat Bongi laatkom* $P(V \text{ or } B) = 1 - 0,7$ $\qquad\qquad\quad = 0,3$	✓ answer (1)
11.1.2	$P(V \text{ or } B) = P(V) + P(B) - P(V \text{ and } B)$ $\qquad 0,3 = 0,25 + P(B) - 0,15$ $\qquad P(B) = 0,2$	✓ $P(V \text{ or } B) = P(V) + P(B)$ $-P(V \text{ and } B)$ ✓ substitution ✓ 0,2 (3)
11.1.3	$P(V) \times P(B) = 0,25 \times 0,2$ $\qquad\qquad\quad = 0,05$ $P(V) \times P(B) \neq P(V \text{ and } B)$ V and B are NOT independent/ *V en B is NIE onafhanklik nie.*	✓ $P(V) \times P(B) = 0,05$ ✓ $P(V) \times P(B) \neq P(V \text{ and } B)$ ✓ NOT independent (3)
11.2.1	$6! = 720$	✓ 6! or 720 (2)
11.2.2	Number of arrangements $= 3! \times 3! \times 2$ $= 72$	✓ $3! \times 3!$ ✓ $\times 2$ ✓ answer (3)
11.2.3	$P(\text{hearts next to each other}) = \dfrac{3! \times 4!}{6!}$ $\qquad\qquad\qquad\qquad\qquad = \dfrac{144}{720}$ $\qquad\qquad\qquad\qquad\qquad = \dfrac{1}{5}$ or 0,2 or 20% **OR/*OF*** $P(\text{hearts next to each other}) = \dfrac{4 \times 3! \times 3!}{6!}$ $\qquad\qquad\qquad\qquad\qquad = \dfrac{144}{720}$ $\qquad\qquad\qquad\qquad\qquad = \dfrac{1}{5}$ or 0,2 or 20%	✓ ✓ $3! \times 4!$ ✓ $\dfrac{1}{5}$ or 0,2 or 20% **OR/*OF*** ✓ ✓ ✓ $\dfrac{1}{5}$ or 0,2 or 20% (3) **[15]**

TOTAL/*TOTAAL*: 150