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basic education

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*

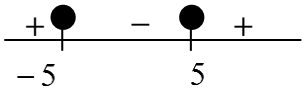
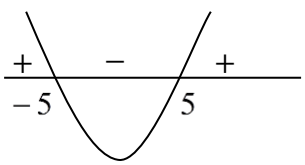
MARKS/*PUNTE*: 150

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

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

	$\frac{3^{2018}+3^{2016}}{3^{2017}}$ $=\frac{3^{2016}\left(3^2+1\right)}{3^{2017}}$ $=\frac{10}{3}$ **OR/*OF*** $\frac{3^{2018}+3^{2016}}{3^{2017}}$ $=\frac{3^{2018}}{3^{2017}}+\frac{3^{2016}}{3^{2017}}$ $=3+\frac{1}{3}$ $=3\frac{1}{3}$ or $\frac{10}{3}$	✓ common factor 3^{2016} ✓ answer **OR/*OF*** ✓ dividing by 3^{2017} ✓ answer (2)
1.5.1	$3x-5\geq 0$ and $x\neq 3$ $x\geq\frac{5}{3}$ and $x\neq 3$	✓ $3x-5\geq 0$ ✓ $x\geq\frac{5}{3}$ ✓ $x\neq 3$ (3)
1.5.2	$\frac{\sqrt{3x-5}}{x-3}=1$ $\sqrt{3x-5}=x-3$ $3x-5=(x-3)^2$ $3x-5=x^2-6x+9$ $x^2-9x+14=0$ $(x-7)(x-2)=0$ $x\neq 2$ 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	$30\ ;\ 10\ ;\ \frac{10}{3}\ldots\ldots$ $a=30 \qquad r=\frac{1}{3}$ $T_n = ar^{n-1}$ $\frac{10}{729}=30\left(\frac{1}{3}\right)^{n-1}$ $\frac{1}{2187}=3^{1-n}$ $3^{-7}=3^{1-n}$ $-7=1-n$ $n=8$ **OR/*OF*** $\frac{1}{2187}=\left(\frac{1}{3}\right)^{n-1}$ $\left(\frac{1}{3}\right)^{7}=\left(\frac{1}{3}\right)^{n-1}$ $7=n-1$ $n=8$	✓ $r=\frac{1}{3}$ ✓substitution into correct formula ✓ $3^{-7}=3^{1-n}$ or $\left(\frac{1}{3}\right)^{7}=\left(\frac{1}{3}\right)^{n-1}$ or use of logs ✓ $n=8$ (4)
2.1.2	$S_\infty=\frac{a}{1-r}$ $=\frac{30}{1-\frac{1}{3}}$ $=45$	✓substitution into correct formula ✓answer (2)
2.2	$S_n=a+(a+d)+.....+(a+(n-2)d)+(a+(n-1)d) \quad (1)$ $S_n=(a+(n-1)d)+(a+(n-2)d)+.....+(a+d)+a \quad (2)$ Adding both equations/*Tel die twee vergelykings bymekaar:* $2S_n=2a+(n-1)d+2a+(n-1)d+2a+(n-1)d+.....$ $=n[2a+(n-1)d]$ $S_n=\frac{n}{2}[2a+(n-1)d]$ **OR/OF** $S_n=a+(a+d)+.....+(a+(n-2)d)+T_n \quad (1)$ $S_n=T_n+(T_n-d)+(T_n-2d)+.....+a \quad (2)$ Adding both equations/*Tel die twee vergelykings bymekaar:* $2S_n=(a+T_n)+(a+T_n)+(a+T_n)+.....+(a+T_n)$ $S_n=\frac{n}{2}(a+T_n)$ but $Tn=a+(n-1)d$ $S_n=\frac{n}{2}[2a+(n-1)d]$	✓expanding S_n ✓reverse writing ✓ $2S_n=n[2a+(n-1)d]$ ✓ $S_n=\frac{n}{2}[2a+(n-1)d]$ (4) ✓expanding S_n ✓reverse writing ✓ $2S_n=n(a+T_n)$ ✓ $S_n=\frac{n}{2}[2a+(n-1)d]$ (4) **[10]**

QUESTION/*VRAAG* 3

3.1	$-1\ ;\ 2\ ;\ 5$ $T_n = -1+(n-1)(3)$ $= 3n-4$	✓ $3n$ ✓ -4 (2)
3.2	$T_{43} = 3(43)-4$ $= 125$ **OR/ OF** $T_{43} = -1+(43-1)(3)$ $= 125$ NOTE: Answer only 2 / 2	✓ subs of 43 ✓ answer (2)
3.3	$T_n = 3n-4$ $S_n = \sum_{k=1}^{n} T_k = -1+2+5+.....+3n-4$ $S_n = \frac{n}{2}[-1+3n-4]$ or $S_n = \frac{n}{2}[-2+(n-1)3]$ $= \frac{n}{2}[3n-5]$ $= \frac{3n^2-5n}{2}$ **OR/*OF*** $T_n = 3n-4$ $\sum_{k=1}^{n} T_k = 3(1)-4+3(2)-4+3(3)-4+.....+3n-4$ $= 3(1+2+3+.....+n)-4n$ $= \frac{3n(n+1)}{2}-4n$ $= \frac{3n^2-5n}{2}$	✓ $S_n = \sum_{k=1}^{n} T_k$ ✓ substitution into correct formula ✓ $\frac{n}{2}[3n-5]$ or $\frac{3n^2-5n}{2}$ **OR/*OF*** ✓ $(1)-4+3(2)-4+3(3)-4+$ $.....+3n-4$ ✓ $3(1+2+3+.....+n)-4n$ ✓ $\frac{3n^2-5n}{2}$ (3)

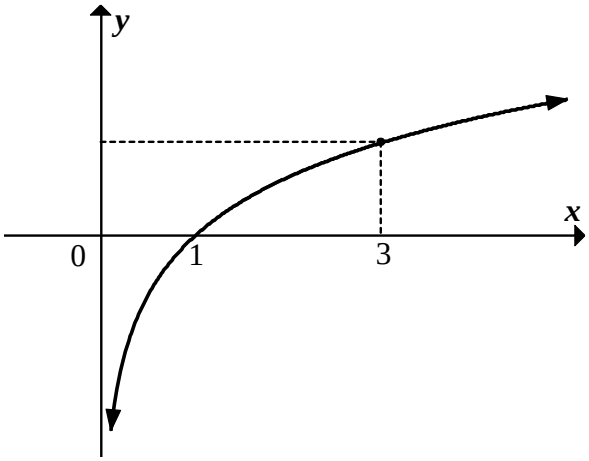
3.4	$T_{11} = (T_{11} - T_{10}) + (T_{10} - T_9) + (T_9 - T_8) + \ldots + (T_3 - T_2) + (T_2 - T_1) + T_1$ $125 = 29 + 26 + 23 + \ldots 2 + T_1$ $= \frac{10}{2}(29 + 2) + T_1$ $= 155 + T_1$ $T_1 = -30$ NOTE: Answer only 1 / 6 If they only use $3n - 4$ breakdown 0 / 6 **OR/*OF*** $T_n = an^2 + bn + c$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

QUESTION/*VRAAG* 4

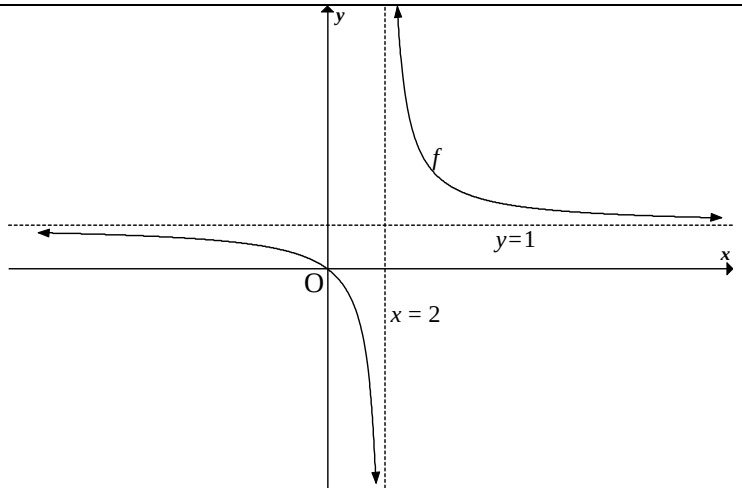
4.1	E(4 ; –9)	✓ $x = 4$ ✓ $y = -9$ (2)
4.2	$f(x) = (x-4)^2 - 9$ $(x-4)^2 - 9 = 0$ $(x-4)^2 = 9$ $x - 4 = \pm 3$ $x = 7$ or $x = 1$ A(1 ; 0) **OR/*OF*** $f(x) = (x-4)^2 - 9$ $0 = x^2 - 8x + 16 - 9$ $0 = x^2 - 8x + 7$ $(x-7)(x-1) = 0$ $x = 7$ or $x = 1$ A(1 ; 0)	✓ $y = 0$ ✓ $x - 4 = \pm 3$ ✓ A(1 ; 0) **OR/*OF***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

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

QUESTION/*VRAAG* 5

5.1	$a^0 = 1$ T(0 ; 1)	✓ $x = 0$ ✓ $y = 1$ (2)
5.2	$g(x) = a^x$ $9 = a^2$ $a = 3$ $a > 0$	✓ substitution ✓ $a = 3$ (2)
5.3	$y = \left(\frac{1}{3}\right)^x$ or $y = 3^{-x}$	✓✓ $y = \left(\frac{1}{3}\right)^x$ (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 $(0;0)$ $0=\frac{a}{0+p}+1$ $\frac{a}{p}=-1$ $a=-p$ Subs P: $\sqrt{2}+1=\frac{a}{\sqrt{2}+2+p}+1$ $\sqrt{2}=\frac{a}{\sqrt{2}+2+p}$ $2+2\sqrt{2}+\sqrt{2}p=a$ $2+2\sqrt{2}=a-p\sqrt{2}=a+a\sqrt{2}$ $2\left(1+\sqrt{2}\right)=a\left(1+\sqrt{2}\right)$ $a=2$; $p=-2$ NOTE: Answer only 2 / 5	✓ $0=\frac{a}{0+p}+1$ ✓ $a=-p$ ✓ substitution ✓ $a=2$ ✓ $p=-2$ (5)
6.3		✓$y=1$ ✓$x=2$ ✓shape ✓(0 ; 0) (4) **[10]**

QUESTION/*VRAAG* 7

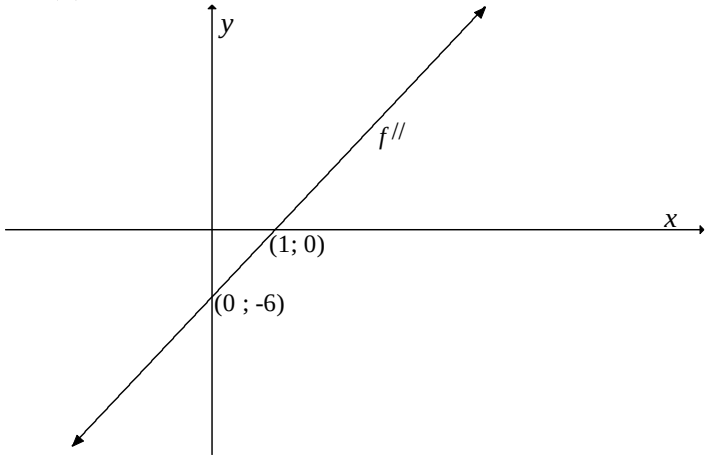
7.1	$F = \frac{x\left[(1+i)^n - 1\right]}{i}$ $= \frac{2500\left[\left(1+\frac{0,06}{12}\right)^{60} - 1\right]}{\frac{0,06}{12}}$ $= \text{R}174\ 425,08$	✓ $n = 60$ and $i = \frac{0,06}{12} / 0,005$ ✓ correct substitution into correct formula ✓ answer (3)
7.2.1	After eleven months, Genevieve will owe/ *Na elf maande skuld Genevieve* $\text{A} = 82\ 000\left(1+\frac{0,15}{12}\right)^{11}$ $= \text{R}\ 94\,006,79$	✓ $n = 11$ ✓ correct substitution into correct formula ✓ answer (3)
7.2.2	$P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $94\,006,79 = \frac{3\ 200\left[1-\left(1+\frac{0,15}{12}\right)^{-n}\right]}{\frac{0,15}{12}}$ $\frac{94\ 006,79}{3\,200} \times \frac{0,15}{12} = 1-\left(1+\frac{0,15}{12}\right)^{-n}$ $\left(1+\frac{0,15}{12}\right)^{-n} = 1-0,3672147...$ $-n\log\left(1+\frac{0,15}{12}\right) = \log 0,6327852...$ $-n = -36,8382...$ $n = 36,84$ Genevieve will have to pay 36 installments of R3 200	✓ 94 006,79 ✓ substitute into correct formula ✓ correct use of logs (logs to be defined) ✓ n =36,84 ✓ 36 installments (5)

7.2.3	$P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $= \frac{3200\left[1-\left(1+\frac{0,15}{12}\right)^{-0,83826912}\right]}{\frac{0,15}{12}}$ $P = 2652$ Outstanding balance after 36 installments is R2 652 Final payment will be: $A = 2652,00\left(1+\frac{0,15}{12}\right)^{1}$ $= R\ 2685,00$ **OR/*OF*** Balance : $94006,79\left(1+\frac{0,15}{12}\right)^{36} - \frac{3200\left[\left(1+\frac{0,15}{12}\right)^{36}-1\right]}{\frac{0,15}{12}}$ $= R2\ 651,72$ Final payment will be: $A = 2651,72\left(1+\frac{0,15}{12}\right)^{1}$ $= R\ 2\ 685,00$	✓$n = -083826912$ ✓substitute into correct formula ✓answer ✓ $2652,00\left(1+\frac{0,15}{12}\right)^{1}$ ✓answer **OR/*OF*** ✓$94006,79\left(1+\frac{0,15}{12}\right)^{36}$ ✓$\frac{3200\left[\left(1+\frac{0,15}{12}\right)^{36}-1\right]}{\frac{0,15}{12}}$ ✓2 651,72 ✓ $2651,72\left(1+\frac{0,15}{12}\right)^{1}$ ✓answer (5) **[16]**

QUESTION/*VRAAG* 8

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

QUESTION/*VRAAG* 9

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

	. $f(x) = -3x^3 + x$ $-9x^2 + 1 = 0$ $x = \frac{1}{3}$ or $x = -\frac{1}{3}$ 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 $\frac{2}{3}$.	✓ $-9x^2 + 1 = 0$ ✓ $x = \frac{1}{3}$ *or* $x = -\frac{1}{3}$ ✓ 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* $P(V \text{ or } B) = 1 - 0,7$ $= 0,3$	✓ answer (1)
11.1.2	$P(V \text{ or } B) = P(V) + P(B) - P(V \text{ and } B)$ $0,3 = 0,25 + P(B) - 0,15$ $P(B) = 0,2$	✓ $P(V \text{ or } B) = P(V) + P(B) - P(V \text{ and } B)$ ✓substitution ✓ 0,2 (3)
11.1.3	$P(V) \times P(B) = 0,25 \times 0,2$ $= 0,05$ $P(V) \times P(B) \neq P(V \text{ and } B)$ 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	$P(\text{hearts next to each other}) = \frac{3! \times 4!}{6!}$ $= \frac{144}{720}$ $= \frac{1}{5}$ or 0,2 or 20% **OR/*OF*** $P(\text{hearts next to each other}) = \frac{4 \times 3! \times 3!}{6!}$ $= \frac{144}{720}$ $= \frac{1}{5}$ or 0,2 or 20%	✓ ✓ $3! \times 4!$ ✓ $\frac{1}{5}$ or 0,2 or 20% **OR/*OF*** ✓ ✓ ✓ $\frac{1}{5}$ or 0,2 or 20% (3) **[15]**

TOTAL/*TOTAAL*: 150