basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/
SENIORSERTIFIKAAT-EKSAMEN

MATHEMATICS P1/*WISKUNDE V1*

2016

MEMORANDUM

MARKS/*PUNTE*: 150

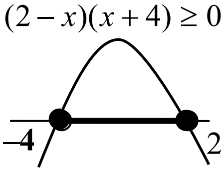
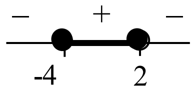
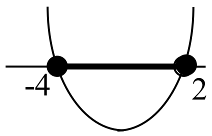
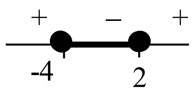
This memorandum consists of 20 pages and an addendum of 7 pages
Hierdie memorandum bestaan uit 20 bladsye en 'n addendum uit 7 bladsye.

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	$4x^2 - 25 = 0$ $(2x-5)(2x+5) = 0$ $x = \frac{5}{2}$ or/of $x = -\frac{5}{2}$ **OR/*OF*** $4x^2 = 25$ $x^2 = \frac{25}{4}$ $x = \pm\sqrt{\frac{25}{4}}$ $x = \frac{5}{2}$ or/of $x = -\frac{5}{2}$	✓✓ factors ✓ answers (3) ✓ $x^2 = \frac{25}{4}$ ✓ $x = \pm\sqrt{\frac{25}{4}}$ ✓ answer (3)
1.1.2	$x^2 - 5x - 2 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(-2)}}{2(1)}$ $= \frac{5 \pm \sqrt{33}}{2}$ $x = 5{,}37$ or/of $x = -0{,}37$ **OR/*OF*** $x^2 - 5x + \frac{25}{4} = 2 + \frac{25}{4}$ $\left(x - \frac{5}{2}\right)^2 = \frac{33}{4}$ $x - \frac{5}{2} = \pm\frac{\sqrt{33}}{2}$ $x = \frac{5 \pm \sqrt{33}}{2}$ $x = -0{,}37$ or $x = 5{,}37$	✓ correct substitution into correct formula ✓ answer ✓ answer (3) ✓ for adding $\frac{25}{4}$ on both sides ✓answer ✓answer (3)

1.1.3	$(2-x)(x+4)\geq 0$  **OR / OF**  $-4\leq x\leq 2$ **OR / OF** $x\in[-4;2]$ **OR / OF** $(2-x)(x+4)\geq 0$ $(x-2)(x+4)\leq 0$  **OR / *OF***  $-4\leq x\leq 2$ **OR / OF** $x\in[-4;2]$	✓method ✓critical values in context of inequality ✓inequality or interval (3) ✓change of inequality ✓critical values in context of inequality ✓inequality or interval (3)
1.1.4	$x-3x^{\frac{1}{2}}-4=0$ $\left(x^{\frac{1}{2}}-4\right)\left(x^{\frac{1}{2}}+1\right)=0$ $x^{\frac{1}{2}}=4$ or $x^{\frac{1}{2}}=-1$ $x=16$ N/A **OR/OF** $x-3x^{\frac{1}{2}}-4=0$ Let $x^{\frac{1}{2}}=k$ $k^2-3k-4=0$ $(k-4)(k+1)=0$ $x^{\frac{1}{2}}=4$ or $x^{\frac{1}{2}}=-1$ $x=16$ N/A **OR/OF** $x-3x^{\frac{1}{2}}=4$ $x-4=3\sqrt{x}$ Restrictions/*Beperkings*: $9x=x^2-8x+16$ $x\geq 4$ and $x\geq 0$ $x^2-17x+16=0$ $(x-1)(x-16)=0$ $x=1$ or $x=16$ N/A	✓ standard form ✓ factors ✓ $x^{\frac{1}{2}}=4$ ✓ $x^{\frac{1}{2}}=-1$ ✓ answer (5) ✓ standard form ✓ factors ✓ $x^{\frac{1}{2}}=4$ ✓ $x^{\frac{1}{2}}=-1$ ✓ answer (5) ✓ isolating $3\sqrt{x}$ or $3x^{\frac{1}{2}}$ ✓ standard form ✓ factors ✓ answers ✓ selection (5)

1.2	$y = 2x + 1$ $x^2 - 3x - 4 - (2x+1) = (2x+1)^2$ $x^2 - 3x - 4 - 2x - 1 = 4x^2 + 4x + 1$ $3x^2 + 9x + 6 = 0$ $x^2 + 3x + 2 = 0$ $(x+2)(x+1) = 0$ $x = -2$ or $x = -1$ If $x = -2$, then $y = -3$ If $x = -1$, then $y = -1$ **OR/OF** $x = \frac{y-1}{2}$ $\left(\frac{y-1}{2}\right)^2 - 3\left(\frac{y-1}{2}\right) - 4 - y = y^2$ $\frac{y^2 - 2y + 1}{4} - 3\left(\frac{y-1}{2}\right) - 4 - y = y^2$ $y^2 - 2y + 1 - 6y + 6 - 16 - 4y = 4y^2$ $3y^2 + 12y + 9 = 0$ $y^2 + 4y + 3 = 0$ $(y+3)(y+1) = 0$ $y = -3$ or $y = -1$ If $y = -3$, then $x = -2$ If $y = -1$, then $x = -1$	✓ y subject of formula ✓ substitution ✓ standard form ✓ factors ✓ values of x ✓ values of y (6) ✓ x subject of formula ✓ substitution ✓ standard form ✓ factors ✓ values of y ✓ values of x (6)
1.3.1	$2x + 1 \geq 0$ $x \geq -\frac{1}{2}$ **OR/OF** $\left[-\frac{1}{2}; \infty\right)$	✓ answer (1) ✓ answer (1)

1.3.2	$f(x)=2x-1$ $\sqrt{2x+1}=2x-1$ Restrictions/*Beperkings* : $2x+1=4x^2-4x+1$ $x\geq-\frac{1}{2}$ and $x\geq\frac{1}{2}$ $4x^2-6x=0$ $x(4x-6)=0$ $x=\frac{3}{2}$ or $x=0$ $\therefore x=\frac{3}{2}$	✓ $\sqrt{2x+1}=2x-1$ ✓ standard form ✓ factors ✓ answers ✓ correct selection (5) **[26]**

QUESTION/*VRAAG 2*

2.1.1	$27-b=b-13$ $b=\frac{27+13}{2}$ $b=20$ $27-20=13-a$ $a=6$ **OR/OF** $27-13=2d$ $d=7$ $b=13+7=20$ $a=13-7=6$	✓ $27-b=b-13$ ✓ $27-20=13-a$ (2) ✓ $d=7$ or $27-13=2d$ ✓ $b=13+7$ $a=13-7$ (2)
2.1.2	$a=6$ $d=7$ $S_n=\frac{n}{2}[2a+(n-1)d]$ $S_{20}=\frac{20}{2}[2(6)+(20-1)(7)]$ $=1450$ **OR/OF** $T_{20}=a+19(d)$ $=6+19(7)$ $=139$ $S_n=\frac{n}{2}[a+T_n]$ $S_{20}=\frac{20}{2}[6+139]$ $=1450$	✓ $d=7$ ✓ correct substitution into correct formula ✓ answer (3) ✓ $d=7$ ✓ $T_{20}=139$ ✓ answer (3)

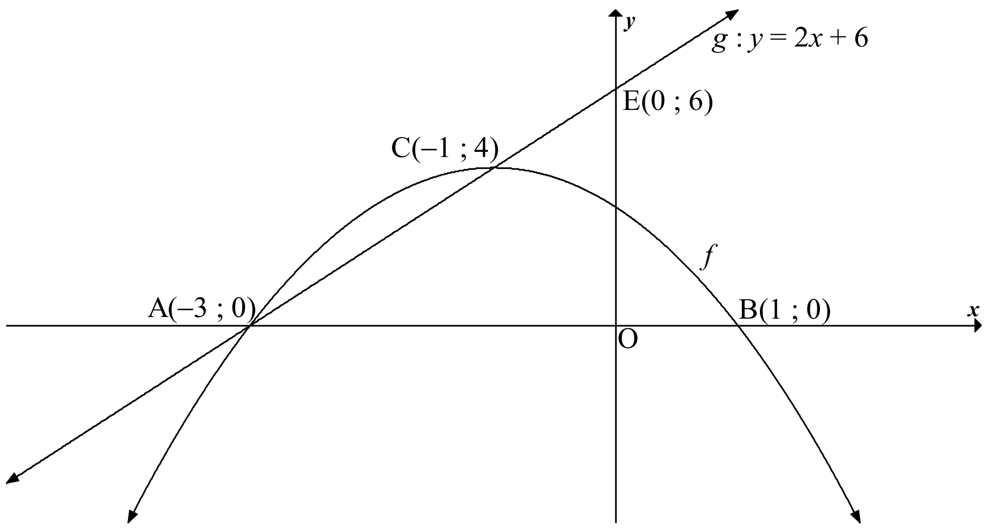
2.1.3	$T_n = 6 + (n-1)(7)$ $= 7n - 1$ $\sum_{n=1}^{20}(6 + 7(n-1))$ $= \sum_{n=1}^{20}(7n-1)$	✓ $T_n = 6 + (n-1)(7)$ or $7n-1$ ✓ $\sum_{n=1}^{20}$ (2)
2.2.1	$r = \frac{(x-2)(x+2)}{x-2}$ or $r = \frac{(x^2-4)(x+2)}{x^2-4}$ $= x + 2$ For convergence/Om te konvergeer: $-1 < r < 1$ $-1 < x + 2 < 1$ $-3 < x < -1$	✓ $\frac{(x^2-4)}{x-2}$ or $\frac{(x-2)(x+2)}{x-2}$ or $\frac{(x^2-4)(x+2)}{x^2-4}$ ✓ $r = x + 2$ ✓ $-1 < r < 1$ ✓ answer (4)
2.2.2	$\left(-\frac{7}{2}\right) + \left(-\frac{7}{4}\right) + \left(-\frac{7}{8}\right) + ...$ $S_\infty = \frac{a}{1-r}$ $= \frac{-\frac{7}{2}}{1-\frac{1}{2}}$ $= -7$ **OR/OF** $S_\infty = \frac{a}{1-r}$ $= \frac{(x-2)}{1-(x+2)}$ $= \frac{x-2}{-x-1}$ $= \frac{-\frac{3}{2}-2}{\frac{3}{2}-1}$ $= \frac{-\frac{7}{2}}{\frac{1}{2}}$ $= -7$	✓ $a = -\frac{7}{2}$ ✓ substitution into correct formula ✓ answer (3) ✓ substitution into correct formula ✓ substitution of $x = -\frac{3}{2}$ ✓answer (3) **[14]**

QUESTION/*VRAAG 3*

3.1	$-1 \quad 2 \quad 9 \quad 20$ $3 \quad 7 \quad 11$ $4 \quad 4$ $2a = 4$ $a = 2$ $3a + b = 3$ $b = -3$ $a + b + c = -1$ $c = 0$ $T_n = 2n^2 - 3n$	✓2^{nd} difference = 4 ✓ $a = 2$ ✓ $b = -3$ ✓ $T_n = 2n^2 - 3n$ (4)
	OR/OF $T_n = T_1 + (n-1)d_1 + \frac{(n-1)(n-2)}{2}d_2$ $= (-1) + (n-1)(3) + \frac{(n-1)(n-2)}{2}(4)$ $= -1 + 3n - 3 + 2n^2 - 6n + 4$ $= 2n^2 - 3n$	✓ formula ✓ 2^{nd} difference = 4 ✓simplifying ✓ $T_n = 2n^2 - 3n$ (4)
3.2	$T_n = 2n^2 - 3n$ $T_{48} = 2(48)^2 - 3(48)$ $= 4464$	✓ substitution ✓ answer (2)
3.3	$3 + 7 + 11.......$ $S_n = \frac{n}{2}[2a + (n-1)d]$ $= \frac{n}{2}[2(3) + (n-1)4]$ $= \frac{n}{2}[6 + 4n - 4]$ $= 2n^2 + n$	✓ $a = 3$ ✓ $d = 4$ ✓ substitution into correct formula (3)

3.4	$S_{69} = 9591$ and $T_1 = -1$ (of the original sequence/*van die oorspronklike ry*) $9591 + (-1) = 9590$ $S_{69} + T_1 = 9590$ The 70^{th} term of the original sequence will have a value of 9590 **OR/OF** $2n^2 - 3n = 9590$ $2n^2 - 3n - 9590 = 0$ $(n-70)(2n+137) = 0$ $n = 70$ $T_{70} = 9590$	✓$(9591)+(-1)$ ✓70 (2) ✓ $2n^2 - 3n - 9590 = 0$ ✓70 (2) **[11]**

QUESTION/*VRAAG 4*



4.1	(0 ; 3)	✓ (0 ; 3) (1)
4.2	$x = -\frac{b}{2a}$ or $-2x - 2 = 0$ $= -\frac{(-2)}{2(-1)}$ $\therefore x = -1$ $= -1$ $y = -(-1)^2 - 2(-1) + 3$ or $y = \frac{4ac - b^2}{4a}$ $= 4$ $= \frac{4(-1)(3) - (-2)^2}{4(-1)}$ $C(-1\,;4)$	✓ $x = -\frac{(-2)}{2(-1)}$ or $-2x - 2 = 0$ ✓ simplification ✓ in the context of a turning point $-(-1)^2 - 2(-1) + 3$ $\frac{4(-1)(3) - (-2)^2}{4(-1)}$ (3)

4.3	$B(1\,;\,0)$ By symmetry/*Deur simmetrie* $A(-3\,;\,0)$ **OR/OF** $x^2+2x-3=0$ $(x+3)(x-1)=0$ $x=-3$ or $x=1$ $A(-3\,;0)$	✓ $A(-3\,;\,0)$ (1) ✓ $A(-3\,;\,0)$ (1)
4.4	Equation of g: $m=\dfrac{4-0}{-1+3}$ $=2$ $y=2x+q$ **OR/OF** $y-0=2(x+3)$ $0=2(-3)+q$ or $4=2(-1)+q$ $y=2x+6$ $q=6$ or $y-4=2(x+1)$ $y=2x+6$ $E(0\,;6)$ $C(-1\,;4)$ $CE=\sqrt{(0+1)^2+(6-4)^2}$ $=\sqrt{5}$ units/2,24 units	✓ $m=2$ ✓subs of A(–3;0) or C (–1;4) ✓ $y=2x+6$ ✓ $E(0\,;6)$ ✓substitution into distance formula ✓answer (6)
4.5	$f'(x)=-2x-2$. But $m_{\tan}=2$ $-2x-2=2$ $x=-2$ $f(-2)=3$ $y=2x+k$ $3=2(-2)+k$ $k=7$ **OR/OF** $-x^2-2x+3=2x+k$ $-x^2-4x+3-k=0$ $x^2+4x-3+k=0$ For equal roots: $\Delta=b^2-4ac=0$ $(-4)^2-4(-1)(3-k)=0$ $(4)^2-4(1)(k-3)=0$ $16+12-4k=0$ or $16-4k+12=0$ $k=7$ $k=7$	✓ $-2x-2$ ✓ $-2x-2=2$ ✓ $x=-2$ ✓ $y=3$ ✓answer (5) ✓ $-x^2-2x+3=2x+k$ ✓standard form ✓ $b^2-4ac=0$ ✓substitution ✓answer (5)

4.6	g: $y=2x+6$ g^{-1}: $x=2y+6$ $2y=x-6$ $y=\frac{x-6}{2}$ or $y=\frac{x}{2}-3$	✓ $x=2y+6$ ✓ $y=\frac{x-6}{2}$ or $y=\frac{x}{2}-3$ (2)
4.7	$g(x)\geq g^{-1}(x)$ $2x+6\geq\frac{x-6}{2}$ $4x+12\geq x-6$ $3x\geq-18$ $x\geq-6$	✓ $2x+6\geq\frac{x-6}{2}$ ✓ $4x+12\geq x-6$ ✓ $x\geq-6$ (3) **[21]**

QUESTION/*VRAAG 5*

5.1	$r=2$	✓ $r=2$ (1)
5.2	$g(x)=2^x+2$ $g(0)=2^0+2=3$ B(0 ; 3) $3=\frac{3}{0-p}+2$ $p=-3$	✓ $g(0)=2^0+2$ ✓ $y=3$ ✓ substitute B(0 ; 3) and $q=2$ ✓ $p=-3$ (4)
5.3	at A: $x=-3$ $y=2^{-3}+2=2\frac{1}{8}$ $A\left(-3\,;2\frac{1}{8}\right)$ or $A\left(-3\,;\frac{17}{8}\right)$ or $A(-3\,;2{,}125)$	✓ at A : $x=-3$ (p-value) ✓ substitute $x=-3$ into exponential eqution ✓ y-value (3)
5.4	$-3<x\leq 0$ **OR/ OF** $(-3\,;0]$	✓ $-3<x$ ✓ $x\leq 0$ (2)
5.5	$f(x)=\frac{3}{x+3}+2$ $f(x-2)=\frac{3}{x-2+3}+2$ $h(x)=\frac{3}{x+1}+2$	✓ substitution of $x-2$ ✓ $h(x)=\frac{3}{x+1}+2$ (2) **[12]**

QUESTION/*VRAAG 6*

6.1	$A = P(1-i)^n$ $\frac{2}{3}P = P(1-0{,}047)^n$ $\frac{2}{3} = (1-0{,}047)^n$ $\log\frac{2}{3} = n\log(1-0{,}047)$ $n = \frac{\log\frac{2}{3}}{\log(1-0{,}047)}$ $n = 8{,}42$ years	✓$A = \frac{2}{3}P$ ✓substitution into correct formula ✓logs ✓answer (4)
6.2.1	The book value of the tractor after 5 years/*Die boekwaarde van die trekker na 5 jaar* Book value $= x(1-0{,}2)^5$ or $x(0{,}8)^5$ $= 0{,}32768x$	✓ $x(1-0{,}2)^5$ or $x(0{,}8)^5$ ✓ $0{,}32768x$ (2)
6.2.2	Price of new tractor after 5 years/*Prys van nuwe trekker na 5 jaar* Book value $= x(1+0{,}18)^5$ or $x(1{,}18)^5$ $= 2{,}28776x$	✓ $x(1+0{,}18)^5$ or $x(1{,}18)^5$ ✓ $2{,}28776x$ (2)
6.2.3	$F = \frac{x\left[(1+i)^n - 1\right]}{i}$ $= \frac{8000\left[\left(1+\frac{0{,}10}{12}\right)^{60} - 1\right]}{\frac{0{,}10}{12}}$ $= \text{R}619\ 496{,}58$	✓ $i = \frac{0{,}10}{12}$ ✓ $n = 60$ ✓ subst. into future value formula ✓ answer (4)

6.2.4	Sinking fund = New tractor price – Scrap value *Delgingsfonds = Nuwe trekker se prys – boekwaarde* $619\,496{,}58 = x(1+0{,}18)^5 - x(1-0{,}2)^5$ $619\,496{,}58 = x\left[(1{,}18)^5 - (0{,}8)^5\right]$ $x = \dfrac{619\,496{,}58}{\left[(1{,}18)^5 - (0{,}8)^5\right]}$ $x = \text{R}\,316\ \ 057{,}15$ $x = \text{R}\,316\ \ 000$	✓ $619\,496{,}58$ ✓ $x(1+0{,}18)^5 - x(1-0{,}2)^5$ ✓ common factor x ✓ $\text{R}\,316\ \ 000$ (4)
	OR/OF $619\,496{,}58 = x(2{,}28776) - x(0{,}32768)$ $619\,496{,}58 = x[1{,}96008]$ $x = \dfrac{619\,496{,}58}{1{,}96008}$ $x = \text{R}\,316\ \ 056{,}78$ $x = \text{R}\,316\ \ 000$	✓ $619\,496{,}58$ ✓ $x(2{,}28776) - x(0{,}32768)$ ✓ simplification ✓ $\text{R}\,316\ \ 000$ (4) **[16]**

QUESTION/*VRAAG 7*

7.1	$f(x+h)=3(x+h)^2-5=3(x^2+2xh+h^2)-5$ $=3x^2+6xh+3h^2-5$ $f(x+h)-f(x)=3x^2+6xh+3h^2-5-3x^2+5$ $=6xh+3h^2$ $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $=\lim_{h\to 0}\frac{6xh+3h^2}{h}$ $=\lim_{h\to 0}\frac{h(6x+3h)}{h}$ $=\lim_{h\to 0}(6x+3h)$ $=6x$ **OR/OF** $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $=\lim_{h\to 0}\frac{3(x+h)^2-5-(3x^2-5)}{h}$ $=\lim_{h\to 0}\frac{3x^2+6xh+3h^2-5-3x^2+5}{h}$ $=\lim_{h\to 0}\frac{6xh+3h^2}{h}$ $=\lim_{h\to 0}\frac{h(6x+3h)}{h}$ $=\lim_{h\to 0}(6x+3h)$ $=6x$	✓ $3x^2+6xh+3h^2-5$ ✓ $6xh+3h^2$ ✓ $\frac{f(x+h)-f(x)}{h}$ ✓ common factor/ $(6x+3h)$ ✓ answer (5) ✓ $\frac{f(x+h)-f(x)}{h}$ ✓ $3x^2+6xh+3h^2-5$ ✓ $6xh+3h^2$ ✓ common factor/ $(6x+3h)$ ✓ answer (5)
7.2.1	$y=2x^5+\frac{4}{x^3}$ $y=2x^5+4x^{-3}$ $\frac{dy}{dx}=10x^4-12x^{-4}$	✓ $2x^5+4x^{-3}$ ✓ $10x^4$ ✓ $-12x^{-4}$ (3)

7.2.2	$y=\left(\sqrt{x}-x^{2}\right)^{2}$ $y=\left(x^{\frac{1}{2}}-x^{2}\right)^{2}$ $=x-2x^{\frac{5}{2}}+x^{4}$ $\frac{dy}{dx}=1-5x^{\frac{3}{2}}+4x^{3}$	✓ $x-2x^{\frac{5}{2}}+x^{4}$ ✓ 1 ✓ $-5x^{\frac{3}{2}}$ ✓ $4x^{3}$ (4) **[12]**

QUESTION/*VRAAG 8*

8.1	$y=12$	✓answer (1)
8.2	$12=(0-2)^2(0-k)$ $k=-3$ $(x-2)^2(x+3)=0$ $x=-3$ **OR/OF** $y=0$ $(x-2)^2(x-k)=0$ $(x^2-4x+4)(x-k)=0$ $x^3-kx^2-4x^2+4kx+4x-4k=0$ But $-4k$ is the y-intercept *Maar* $-4k$ *is die y-afsnit* $-4k=12$ $k=-3$ $x=-3$	✓ substituting (0;12) ✓ $k=-3$ ✓ $x=-3$ (3) ✓$-4k$ ✓ $-4k=12$ or $k=-3$ ✓ $x=-3$ (3)
8.3	$f(x)=x^3+3x^2-4x^2-12x+4x+12$ $f(x)=x^3-x^2-8x+12$ $f'(x)=3x^2-2x-8$ $3x^2-2x-8=0$ $(3x+4)(x-2)=0$ $x=-\frac{4}{3}$ or $x=2$ $y=\frac{500}{27}$ or $18{,}52$ or $18\frac{14}{27}$ $\mathrm{C}\left(-\frac{4}{3};18{,}52\right)$	✓ $f(x)=x^3-x^2-8x+12$ ✓derivative ✓derivative equal to 0 ✓factors or formula ✓ $x=-\frac{4}{3}$ ✓ $y=\frac{500}{27}$ or $18{,}52$ or $18\frac{14}{27}$ (6)

8.4	$f''(x) = 6x - 2$ $6x - 2 < 0$ $x < \frac{1}{3}$ f is concave down when $x < \frac{1}{3}$ *f is konkaaf na onder vir* $x < \frac{1}{3}$	✓ $6x - 2$ ✓✓ $x < \frac{1}{3}$ (3)
	OR/OF	
	$f''(x) = 6x - 2$ $6x - 2 = 0$ $x = \frac{1}{3}$ f is concave down when $x < \frac{1}{3}$ *f is konkaaf na onder vir* $x < \frac{1}{3}$	✓ $6x - 2$ ✓✓ $x < \frac{1}{3}$ (3)
	OR/OF	
	$x = \frac{x_c + x_d}{2} = \frac{-\frac{4}{3} + 2}{2} = \frac{1}{3}$ or/of $x = -\frac{b}{3a} = -\frac{-1}{3(1)} = \frac{1}{3}$ f is concave down when $x < \frac{1}{3}$ *f is konkaaf na onder vir* $x < \frac{1}{3}$	✓ $\frac{-\frac{4}{3} + 2}{2}$ or $-\frac{-1}{3(1)}$ ✓✓ $x < \frac{1}{3}$ (3) **[13]**

QUESTION/*VRAAG 9*

9.1	$V = \pi r^2 h$ $\pi r^2 h = 340$ $h = \dfrac{340}{\pi r^2}$	✓formula ✓equating to 340 ✓ $h = \dfrac{340}{\pi r^2}$ (3)
9.2	$\text{A} = 2\pi r^2 + 2\pi rh$ $= 2\pi r^2 + 2\pi r\left(\dfrac{340}{\pi r^2}\right)$ $= 2\pi r^2 + \dfrac{680}{r}$ $\text{A}'(r) = 4\pi r - \dfrac{680}{r^2}$ $\text{A}'(r) = 0$ for minimum surface area/ *vir minimum buite-oppervlakte* $4\pi r - \dfrac{680}{r^2} = 0$ $r^3 = \dfrac{680}{4\pi} = \dfrac{170}{\pi}$ $= 54{,}11268$ $r = 3{,}78 \text{ cm}$	✓ $2\pi r^2 + 2\pi rh$ ✓substituting h ✓ $4\pi r - \dfrac{680}{r^2}$ ✓ $\text{A}'(r) = 0$ ✓ $r^3 = \dfrac{680}{4\pi}$ ✓answer (6) **[9]**

QUESTION/*VRAAG 10*

10.1.1 (a)	$\text{P(Female/Vroulik)} = \frac{70}{150} = \frac{7}{15} = 0{,}47$	✓ 70 ✓ answer (2)
10.1.1 (b)	$\text{P(Female playing tennis/Vroulik speel tennis)} = \frac{20}{150} = \frac{2}{15} = 0{,}13$	✓ answer (1)

10.1.2	$\text{P(Female/Vroulik)} = \frac{70}{150}$ $\text{P(Playing/Speel tennis)} = \frac{70}{150}$ $\text{P(Female playing tennis/Vrouliks speel tennis)} = \frac{20}{150} = 0{,}13$ $\text{P(Female/Vroulik)} \times \text{P(Playing/Speel tennis)} = \left(\frac{70}{150}\right)\left(\frac{70}{150}\right) = \frac{4900}{22500} = 0{,}22$ P(Female playing tennis/Vroulik speel tennis) $\neq$ P(Female/Vroulik) $\times$ P(Playing/Speel tennis) Therefore the event of playing tennis is not independent of gender./ Dus is die gebeurtenis om tennis te speel nie onafhanklik van geslag nie **OR/OF** $\text{P(Male/Manlik)} = \frac{80}{150}$ $\text{P(Playing/Speel tennis)} = \frac{70}{150}$ $\text{P(Male playing tennis/Manlik speel tennis)} = \frac{50}{150} = 0{,}33333$ $\text{P(Male/Manlik)} \times \text{P(Playing/Speel tennis)} = \left(\frac{80}{150}\right)\left(\frac{70}{150}\right) = \frac{5600}{22500} = 0{,}25$ P(Male playing tennis/Manlik speel tennis) $\neq$ P(Male/Manlik) $\times$ P(Playing/Speel tennis) Therefore the event of playing tennis is not independent of gender./ Dus is die gebeurtenis om tennis te speel nie onafhanklik van geslag nie. **OR/OF**	✓ $\text{P(Play ten)} = \frac{70}{150}$ ✓ $\left(\frac{70}{150}\right)\left(\frac{70}{150}\right) = \frac{4900}{22500} = 0{,}22$ ✓ P(F play t) $\neq$ P(F) $\times$ P(Play t) Not independent (3) ✓ $\text{P(Play ten)} = \frac{70}{150}$ ✓ $\left(\frac{80}{150}\right)\left(\frac{70}{150}\right) = \frac{5600}{22500} = 0{,}25$ ✓ P(M play t) $\neq$ P(M) $\times$ P(Play t) Not independent (3)

	$\text{P(Male)} = \frac{80}{150}$ $\text{P(Not playing tennis)} = \frac{80}{150}$ $\text{P(Male not playing tennis)} = \frac{80}{150} = 0{,}53333$ $\text{P(Male)} \times \text{P(Not playing tennis)} = \left(\frac{80}{150}\right)\left(\frac{80}{150}\right) = \frac{6400}{22500} = 0{,}28$ $\text{P(Male not playing tennis)} \neq \text{P(Male)} \times \text{P(Not playing tennis)}$ Therefore the event of playing tennis in not independent of gender. **OR/OF** $\text{P(Female)} = \frac{70}{150}$ $\text{P(Not playing tennis)} = \frac{80}{150}$ $\text{P(Female not playing tennis)} = \frac{50}{150} = 0{,}3333$ $\text{P(Female)} \times \text{P(Not playing tennis)} = \left(\frac{70}{150}\right)\left(\frac{80}{150}\right) = \frac{5600}{22500} = 0{,}25$ $\text{P(Female not playing tennis)} \neq \text{P(Female)} \times \text{P(Not playing tennis)}$ Therefore the events of playing tennis and gender are not independent.	✓ $\text{P(not play ten)} = \frac{80}{150}$ ✓ $\left(\frac{80}{150}\right)\left(\frac{80}{150}\right) = \frac{6400}{22500} = 0{,}28$ ✓ $\text{P(M not play t)} \neq \text{P(M)} \times \text{P(Not play t)}$ Not independent (3) ✓ $\text{P(not play ten)} = \frac{80}{150}$ ✓ $\left(\frac{70}{150}\right)\left(\frac{80}{150}\right) = \frac{5600}{22500} = 0{,}25$ ✓ $\text{P(F not play t)} \neq \text{P(F)} \times \text{P(Not play t)}$ Not independent (3)
10.2	$\text{P(B)} = 1 - \text{P(B}')$ $= 1 - 0{,}28$ $= 0{,}72$ $\text{P(A or B)} = \text{P(A)} + \text{P(B)} - \text{P(A and B)}$ $0{,}96 = 0{,}24 + 0{,}72 - \text{P(A and B)}$ $0{,}96 = 0{,}96 - \text{P(A and B)}$ $\text{P(A and B)} = 0$ Events A and B are mutually exclusive *Gebeurtenis A en B is onderling uitsluitend*	✓ $\text{P(B)} = 0{,}72$ ✓ $\text{P(A)} = 0{,}24$ ✓ substitution into correct formula ✓ $\text{P(A and B)} = 0$ (4) **[10]**

QUESTION/*VRAAG 11*

11.1	2 x 2! x 7! = 20 160	✓ 2 x 2! ✓ 7! ✓ 20 160 (3)
11.2	All seated in 9! = 362 880 ways Girls seated together in 4! ways. With the girls as one unit they can all be seated in 4! 6! ways = 17280 *Almal sit op 9! = 362 880 maniere* *Meisies sit saam op 4! maniere.* *Met die meisies as 'n eenheid kan almal op* *4! 6!maniere = 17280 sit* $\text{P(all girls seated together/al die meisies sit saam)} = \frac{4!\,6!}{9!}$ $= \frac{17280}{362880}$ $= \frac{1}{21}$ $= 0{,}047619....$ $= 4{,}76\%$	✓ 9! or 362 880 ✓ 4! 6! or 17280 ✓ $\frac{17280}{362880}$ or $\frac{1}{21}$ or 0,047619 or 4,76% (3) **[6]**
	TOTAL/*TOTAAL:*	**150**