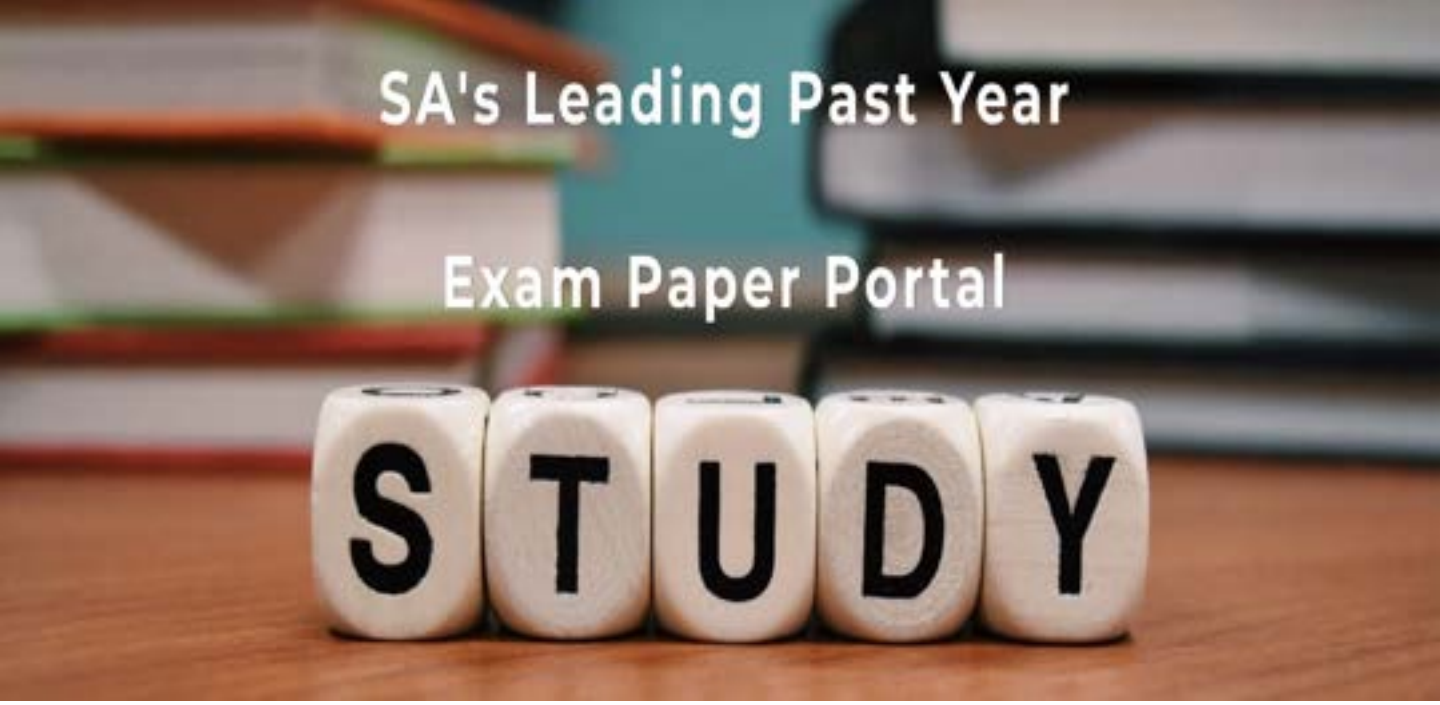


education

Department of Education
FREE STATE PROVINCE

PREPARATORY EXAMINATION
VOORBEREIDINGSEKSAMEN

GRADE/*GRAAD* 12

MATHEMATICS/*WISKUNDE* P1

SEPTEMBER 2019

MARKS/*PUNTE*: 150

MARKING GUIDELINES/*NASIENRIGLYNE*

This marking guidelines consists of 19 pages.
Hierdie nasienriglyne bestaan uit 19 bladsye.

Please turn over/*Blaai om asseblief*

NOTE:

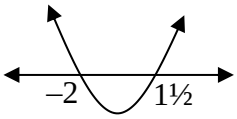
- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate has crossed out an attempt to answer a question and did not redo it, mark the crossed-out version.
- Consistent accuracy applies in ALL aspects of the marking memorandum. Stop marking at the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

LET WEL:

- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n poging om 'n vraag te beantwoord, doodgetrek en nie oorgedoen het nie, sien die doodgetrekte poging na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die memorandum van toepassing. Staak nasien by die tweede berekeningsfout.*
- *Die veronderstelling van antwoorde/waardes in probleemoplossing, word NIE toegelaat NIE.*

QUESTION/*VRAAG* 1

1.1.1	$-\frac{2}{x^2}+\frac{1}{8}=0$ $-16+x^2=0$ $x^2=16$ or/*of* $(x-4)(x+4)=0$ $x=\pm 4$	✓ multiply by LCM/*vermenigvuldig met die KGV* ✓ simplify of factors/*vereenwoordiging van faktore* ✓ both values of *x/biede x- waardes* (3)
1.1.2	$2x^2+9x-24=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $x=\frac{-9+\sqrt{(9)^2-4(2)(-24)}}{2(2)}$ $=\frac{-9+\sqrt{273}}{4}$ $x=1{,}88$ or/*of* $x=-6.38$ **OR/*OF*** $2x^2+9x-24=0$ $x^2+\frac{9}{2}x+\frac{81}{16}=12+\frac{81}{16}$ $\left(x+\frac{9}{4}\right)^2=\frac{273}{16}$ $x+\frac{9}{4}=\frac{\pm\sqrt{273}}{4}$ $x=\frac{-9\pm\sqrt{273}}{4}$ $x=1.88$ or/*of* $x=-6.38$	✓ substitution into correct formula/ *vervang in korrekte formule* ✓ Δ ✓x = 1,88 ✓ x = – 6,38 (4) ✓ $\left(x+\frac{9}{4}\right)^2=\frac{273}{16}$ ✓ $x=\frac{-9\pm\sqrt{273}}{4}$ ✓ 1,88 ✓ $x=-6{,}38$ (4)

1.1.3	$x = 2\sqrt{x} + 3$ $(x-3)^2 = (2\sqrt{x})^2$ $x^2 - 6x + 9 = 4x$ $x^2 - 10x + 9 = 0$ $(x-9)(x-1) = 0$ $x = 9$ or/*of* $x \neq 1$ **OR/*OF*** $x = 2\sqrt{x} + 3$ $x - 2x^{\frac{1}{2}} - 3 = 0$ $(x^{\frac{1}{2}} - 3)(x^{\frac{1}{2}} + 1) = 0$ $x^{\frac{1}{2}} = 3$ or/*of* $x^{\frac{1}{2}} = -1$ $x = 9$	✓ squaring both sides/*kwadreer beide kante* ✓ standard form/*standaardvorm* ✓ factors/*faktore* ✓ answer/*antwoord* (4) ✓ standard form/*standaardvorm* ✓ factors/*faktore* ✓ both equations/*beide vergelykings* ✓ answer/*antwoord* (4)
1.2.1	$2x^2 + x - 6 \geq 0$ $(2x-3)(x+2) = 0$ $x = 1\frac{1}{2}$ or/*of* $x = -2$ $\therefore x \leq -2$ or/*of* $x \geq 1\frac{1}{2}$  	✓ factors/*faktore* ✓ $x \leq -2$ or/*of* ✓ $x \geq 1\frac{1}{2}$ (3)
1.2.2	$-2 < x < 1\frac{1}{2}$ $(-1) + 0 + 1 = 0$	✓ $-2 < x < 1\frac{1}{2}$ ✓ answer/*antwoord* (2)

1.3.1	$x^2-2xy-8y^2=0$ $(x-4y)(x+2y)=0$ $x=4y \quad or/of \quad x=-2y$ $\frac{x}{y}=4 \quad or/of \quad \frac{x}{y}=-2$ **OR/*OF*** $\frac{x^2}{y^2}-2xy-8=0$ $\left(\frac{x}{y}-4\right)\left(\frac{x}{y}+2\right)=0$ $\frac{x}{y}=4 \quad or/of \quad \frac{x}{y}=-2$	✓ factors/*faktore* ✓ $\frac{x}{y}=-2$ ✓ $\frac{x}{y}=4$ (3) ✓ factors/*faktore* ✓ $\frac{x}{y}=-2$ ✓ $\frac{x}{y}=4$ (3)

1.3.2	From 1.3.1: $x=4y$ *or/of* $x=-2y$ substitute/*vervang* x in $y+2x=4$ $y+2(4y)=4$ *or/of* $y+2(-2y)=4$ $y=\frac{4}{9}$ $y=-\frac{4}{3}$ $x=\frac{16}{9}$ $x=\frac{8}{3}$ **OR/*OF*** $y+2x=4 \quad \therefore y=-2x+4$ From/*van* 1.3.1: $x=4y$ *or/of* $x=-2y$ substitute/*vervang* $x=4(-2x+4)$ $x=-2(-2x+4)$ $x=\frac{16}{9}$ $x=\frac{8}{3}$ $y=-2(\frac{16}{9})+4$ $y=-2(\frac{8}{3})+4$ $y=\frac{4}{9}$ $y=-\frac{4}{3}$	✓ $y+2(4y)=4$ ✓ $y+2(-2y)=4$ ✓ $y=\frac{4}{9}$ ✓ $y=-\frac{4}{3}$ ✓ $x=\frac{16}{9}$ ✓ $x=\frac{8}{3}$ (6) ✓ $x=4(-2x+4)$ ✓ $x=-2(-2x+4)$ ✓ $x=\frac{16}{9}$ ✓ $x=\frac{8}{3}$ ✓ $y=\frac{4}{9}$ ✓ $y=-\frac{4}{3}$ (6)
		[25]

QUESTION/*VRAAG* 2

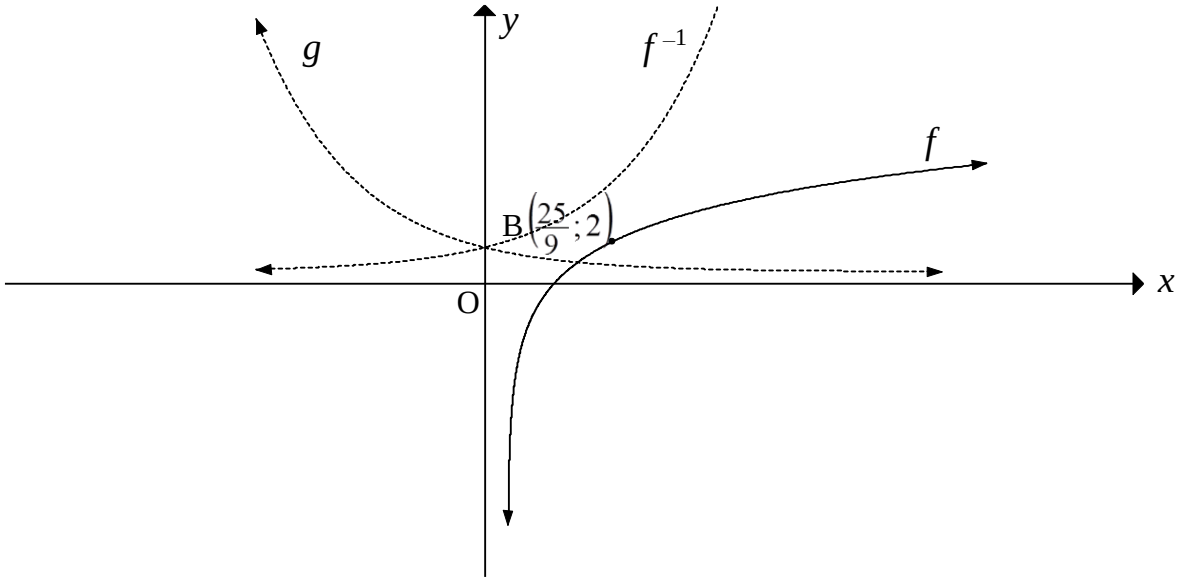
2.1.1	1 ; 6 ; 15 ; 28 ; … 5 9 13 4 4 $\therefore$ 2nd difference/ = 4 *2de verskil = 4*	✓answer/*antwoord* (1)
2.1.2	$T_n = an^2 + bn + c$ $2a = 4 \quad \therefore a = 2$ $3a + b = 5$ $b = 5 - 3(2) = -1$ $a + b + c = 1$ $2 - 1 + c = 1 \quad \therefore c = 0$ $\therefore T_n = 2n^2 - n$ **OR/*OF*** $T_n = 2n^2 + bn + c$ $c = 1 + 4 - 5 = 0$ $Tn = 2n^2 + bn$ $1 = 2 + b$ $b = -1$ $\therefore T_n = 2n^2 - n$	✓a = 2 ✓b = -1 ✓c = 0 ✓answer/*antwoord* (4) ✓a = 2 ✓c = 0 ✓b = -1 ✓ answer/*antwoord* (4)
2.1.3	$T_n = 2n^2 - n$ $2n^2 - n = 2701$ $2n^2 - n - 2701 = 0$ $(n - 37)(2n + 73) = 0$ $n = 37$ or/*of* $n = -\frac{73}{2}$ $\therefore n = 37$	✓ setting up equation/*vergelyking* ✓ factors/*faktore* substitution into the formula/ *vervang in korrekte formule* ✓ answer/*antwoord* (3)
2.2.1	$10 + 15 + 20 + 25 + ... + 185$ $a = 10 \quad d = 5$ $T_n = a + (n - 1)d$ $185 = 10 + (n - 1)5$ $185 = 5n + 5$ $180 = 5n$ $n = 36$	✓ *a* and/en *d* ✓ substitution into correct formula/*vervang in korrekte formule* ✓ answer/*antwoord* (3)

	OR/*OF* $T_n = an + b$ $185 = 5n + 5$ $180 = 5n$ $n = 36$	✓ $T_n = 5n + 5$ ✓ substitution/vervanging ✓ answer/*antwoord* (3)
2.2.2	$10 + 11 + 12 + 13 + 14 + 15 + ... + 185$ $S_{176} = \frac{176}{2}(10 + 185)$ $S_{176} = 17\ 160$ $5 + 10 + 15 + 20 + ... + 185$ $n = 36$ $S_{36} = \frac{36}{2}(10 + 185)$ $s_{36} = 3510$ $\therefore 17160 - 3510 = 13\ \ 650$	✓ substitution into correct formula/*vervang in korrekte formule* ✓ sum of numbers/*som van getalle* ✓ $n = 36$ ✓substitution into correct formula/*vervang in korrekte formule* ✓ sum of multiples of 5/*som van veelvoude van 5* ✓ answer/*antwoord* (6)
		[17]

QUESTION/*VRAAG* 3

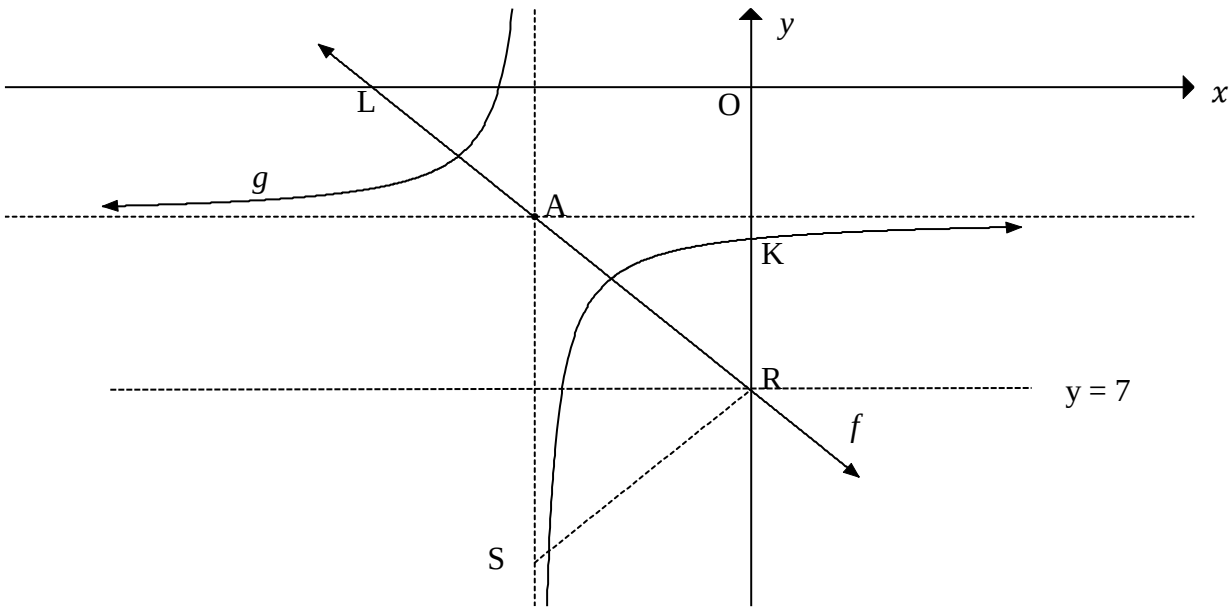
3.1	$\sum_{n=1}^{\infty} 63p^{n-1} = \frac{189}{2}$ $63 + 63p^{-} + 63p^{2} + ...$ $S_{\infty} = \frac{a}{1-r}$ $\frac{189}{2} = \frac{63}{1-p}$ $189(1-p) = 126$ $1-p = \frac{2}{3}$ $p = \frac{1}{3}$	✓first three terms/*eerste drie terme* ✓ substitution into correct formula/*vervang in korrekte formule* ✓ simplification/*vergelyking* ✓ answer/*antwoord* (4)
3.2	$ar^{n-1} < \frac{1}{6561}$ $63\left(\frac{1}{3}\right)^{n-1} < \frac{1}{6561}$ $\left(\frac{1}{3}\right)^{n-1} < \frac{1}{413343}$ $(n-1) > \log_{\left(\frac{1}{3}\right)}\left(\frac{1}{413343}\right)$ $n-1 > 11,7712$ $n > 12,7212$ $\therefore$ smallest/*kleinste* n = 13 terms/*terme*	✓ substitution/*vervanging* ✓ simplification/*vergelyking* ✓ applying logs/*gebruik van logs* ✓ $n > 12,7212$ ✓ $n = 13$ (5)
		[9]

QUESTION/*VRAAG* 4



4.1	$f(x)=\log_a x$ $2=\log_a\left(\frac{25}{9}\right)$ $a^2=\frac{25}{9}$ $a=\frac{5}{3}$ **OR/*OF*** $y=a^x$ $\frac{25}{9}=a^2$ $a=\frac{5}{3}$	✓ substitution/*vervanging* ✓ answer/*antwoord* (2) ✓ substitution/*vervanging* ✓ answer/*antwoord* (2)
4.2	$0<x\leq 1$ **OR/*OF*** $x\in(0;1]$	✓✓ answer/*antwoord* (2)
4.3	$x=\log_{\frac{5}{3}} y$ $y=\left(\frac{5}{3}\right)^x$	✓ swop/*ruil x* and/*en y* ✓ equation/*vergelyking* (2)
4.4	$B^{//}\left(-2\ ;\ \frac{25}{9}\right)$	✓✓ answer/*antwoord* (2)
4.5	$x>2$	✓✓ answer/*antwoord* (2)
		[10]

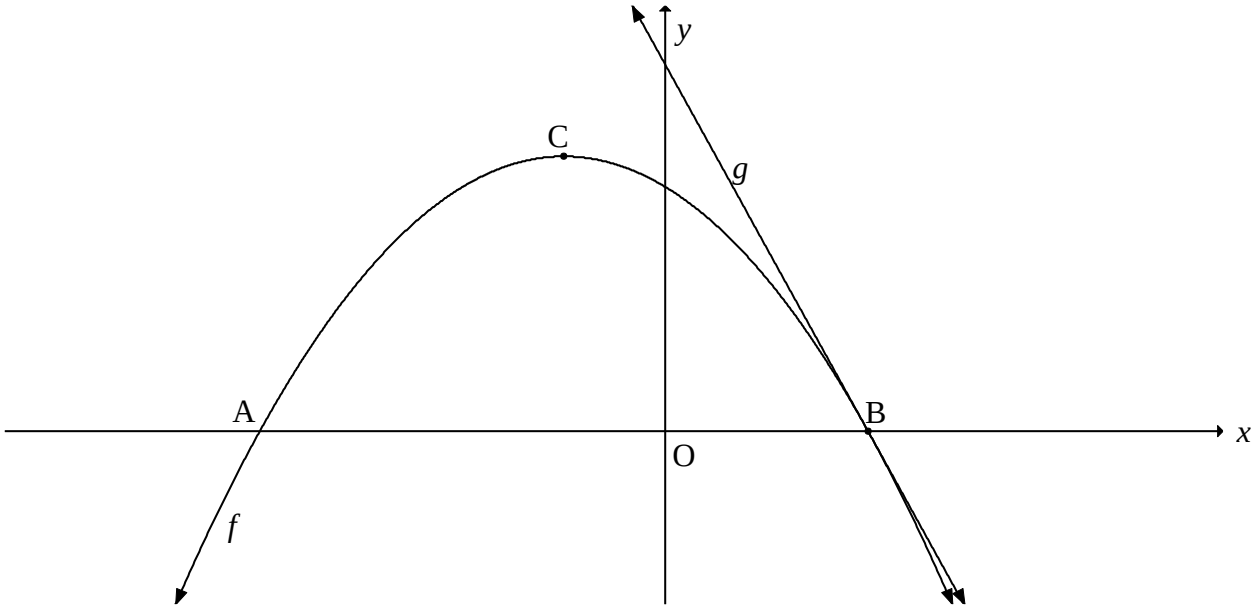
QUESTION/*VRAAG* 5



5.1	A(–4 ; –3) $y=-x+c$ $-3=-(-4)+c$ $c=-7$ $y=-x-7$ **OR/OF** A(–4 ; –3) $y-y_1=m(x-x_1)$ $y-(-3)=-(x-(-4))$ $y=-x-7$	✓ coordinates of A/*koördinate van A* ✓ subst *m* and A/*vervang m en A* ✓ equation/*vergelyking* (3) ✓ coordinates of A/*koördinate van A* ✓ subst *m* and A/*vervang m met A* ✓ equation/*vergelyking* (3)
5.2	$x=-2$ and/*en* $y=-2$	✓ $x=-2$ ✓ $y=-2$ (2)
5.3	$g(x)=\frac{-2}{x+4}-3$ $y=\frac{-2}{0+4}-3 = \frac{-7}{2}=-3\frac{1}{2}$ $K\left[0;\frac{-7}{2}\right]$ R(0 ; –7) $\therefore K=\frac{-7}{0}-(-7)=\frac{7}{2}=3\frac{1}{2}$ units/*eenhede*	✓ K ✓ R ✓ answer/*antwoord* (3)

5.4	A(–4 ; –3) and/*en* S(–4 ; –11) $m_{SR} = \frac{-11-(-7)}{-4-0}$ $m_{SR} \times m_{AR} = -1$ $SR = \sqrt{[(0)-(4)]^2 + [(-7)-(11)]^2} = 4\sqrt{2}$ $AR = \sqrt{[(-4)-(0)]^2 + [(-3)-(7)]^2} = 4\sqrt{2}$ $Area\ of\ /Oppvl\ van\ \Delta ARS = \frac{1}{2}(4\sqrt{2})(4\sqrt{2})$ $= 16\ units^2 / eenhede^2$	✓ coordinates of S/*koördinate van S* ✓ Gradient of SR/*Gradiënt van SR* base/*basis* = $4\sqrt{2}$ and/*en* ✓ $\perp h = 4\sqrt{2}$ ✓ answer/*antwoord* (4)
		[12]

QUESTION/*VRAAG* 6



6.1	$g(x) = 2x - 4$ $0 = 2x - 4$ B(2; 0)	✓ $0 = 2x - 4$ ✓ answer/*antwoord* (2)
6.2	$f(x) = ax^2 + bx + 16$ $f^{/}(x) = 2ax + b$ $-12 = 2a(2) + b$ $-12 = 4a + b$ .....(1) B(2;0): $0 = a(2)^2 + b(2) + 16$ $-16 = 4a + 2b$ .....(2) $(2) - (1)$: $b = -4$ $\therefore -12 = 4a - 4$ $\therefore a = -2$	✓ derivative/*afgeleide* ✓ $f^{/}(2) = -12$ ✓ $f(2) = 0$ ✓equations/*vergelykings* (1) & (2) ✓ $b = -4$ ✓ $a = -2$ (6)
6.3.1	$f(x) = -2x^2 - 4x + 16$ $f^{/}(x) = -4x - 4$ $0 = -4x - 4$ $x = -1$ $y = -2(-1)^2 - 4(-1) + 16$ $y = 18$ C(−1 ; 18) $\therefore \; y \in (-\infty ; 18]$	✓ derivative/*afgeleide* ✓ *x*- value/*x* - *waarde* ✓ substitution/*vervanging* ✓ y value/*y*- *waarde* ✓ answer/*antwoord* (5)

	OR/*OF* $f(x) = -2x^2 - 4x + 16$ $x = \frac{-b}{2a} = \frac{-(-4)}{2(-2)}$ $x = -1$ $y = -2(-1)^2 - 4(-1) + 16$ $y = 18$ $\therefore \quad y \in (-\infty\ ;\ 18]$	✓ substitution into formula/*vervang in formule* ✓ x- value/x- *waarde* ✓ substitution/*vervanging* ✓ y value/y *waarde* ✓ answer/*antwoord* (5)
6.3.2	$-4 < x < -1$ or/*of* $x < 2$	✓$-4 < x < -1$ ✓ $x < 2$ (2)
		[15]

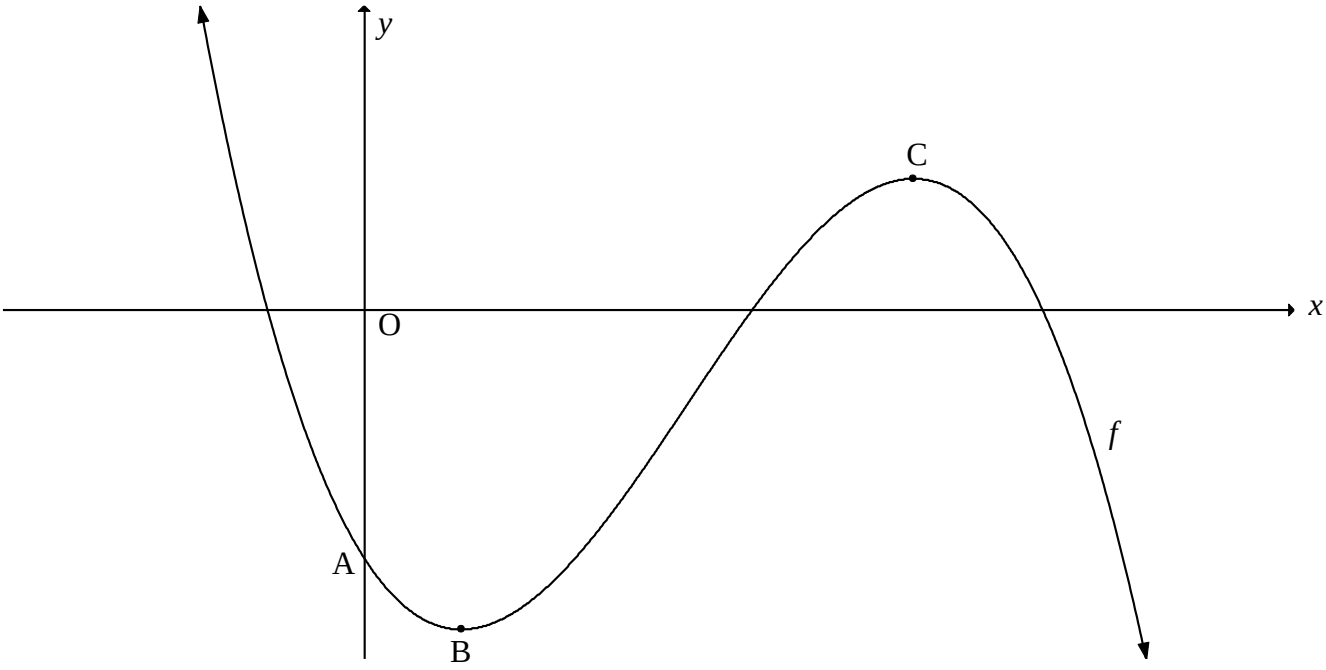
QUESTION/*VRAAG 7*

7.1.1	$\frac{R800\,000}{50} = R16\ 000$	✓ answer/*antwoord* (1)
7.1.2	$A=P(1-i)^n$ $A=R16\,000(1-0.18)^3$ A=R8 821,89	✓ substitution into the correct formula/*vervang in korrekte formule* ✓ answer/*antwoord* (2)
7.1.3	$A = P(1+i)^n$ $21\,200 = 16\,000(1+0,058)^n$ $\frac{21\,200}{16000} = (1,058)^n$ $n = \log_{1,058}\left(\frac{21200}{16000}\right)$ $n = 4,99 \approx 5$ years/*jare*	✓ substitution into the correct formula/ *vervang in die korrekte formule* ✓ using logs/*gebruik van logs* ✓ answer/*antwoord* (3)
7.2.1	$900\,000 = x\left[1-\left(1+\frac{0.08}{12}\right)^{-240}\right]$ $x = \frac{900\,000\left(\frac{0.08}{12}\right)}{\left[1-\left(1+\frac{0.08}{12}\right)^{-240}\right]}$ $x = R\,7\,527.96$	✓ $n = -240$ ✓ substitution into P formula/ *vervang in P formule* ✓ x subject/*x-onderwerp* ✓ answer/*antwoord* (4)
7.2.2	Outstanding Balance at the end of the 18th year/ *Uitstaander Balans op die einde y 18 de jaar.* P balance/= *balans* $\frac{7\ 527,96[1-(1+\frac{0.08}{12})^{-24}]}{\frac{0.08}{12}}$ P balance/= *balans* R166 447,29 Interest over last 2 years/ *Rente oor laaste 2 jaar* = 24 x 7 527,96 – 166 447,29 = R14 223, 75	✓ –24 ✓ substitution into P formula/ *vervang in P formule* ✓ R166 447,29 ✓ $24 \times 7\ 527,96$ ✓ answer/*antwoord* (5)
		[15]

QUESTION/*VRAAG 8*

8.1.1	$f(x)=3x^2$ $f(x+h)=3(x+h)^2$ $f(x+h)=3(x^2+2xh+h^2)=3x^2+6xh+2h^2$ $f(x+h)-f(x)=3x^2+6xh+2h^2-3x^2$ $f^{/}(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$ $f^{/}(x)=\lim\limits_{h\to 0}\dfrac{6xh+2h^2}{h}$ $f^{/}(x)=\lim\limits_{h\to 0}\dfrac{h(6x+2h^2)}{h}$ $f^{/}(x)=\lim\limits_{h\to 0}\left(6x+2h\right)$ $f^{/}(x)=6x$	✓ $f(x+h)$ ✓ $f(x+h)-f(x)$ ✓ simplify numerator/ *vereenvoudig die teller* ✓simplify fraction/ *eenvoudigste breuk* ✓answer/*antwoord* (5)
8.1.2	$\dfrac{d}{dx}\left(\sqrt{x^3}-x+\dfrac{3}{x^2}\right)$ $=\dfrac{d}{dx}\left(x^{\frac{3}{2}}-x+3x^{-2}\right)$ $=\dfrac{3}{2}x^{\frac{1}{2}}-1-6x^{-3}$	✓ rewrite/*herskryf* ✓✓ answer/*antwoord* (3)
8.2.1	$-4x+12=0$ $x=3$	✓ $g(x)=0$ ✓ answer/*antwoord* (2)
8.2.2	$x>3$	✓✓ answer/*antwoord* (2)
		[12]

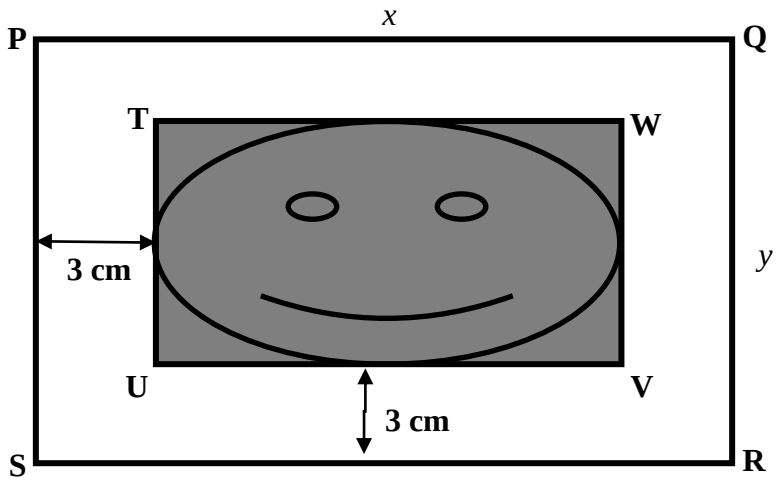
QUESTION/*VRAAG 9*



9.1	A(0 ; –28)	✓ answer/*antwoord* (1)
9.2	$f(x) = -x^3 + 10x^2 - 17x + 28$ $f^{/}(x) = -3x^2 + 20x - 17$ $3x^2 - 20x + 17 = 0$ $(3x - 17)(x - 1) = 0$ $\therefore x = \frac{17}{3}$ *or* $x = 1$ $f\left(\frac{17}{3}\right) = -\left(\frac{17}{3}\right)^3 + 10\left(\frac{17}{3}\right)^2 - 17\left(\frac{17}{3}\right) - 28 \quad \therefore \text{C}\left(\frac{17}{3}\ ;\ \frac{400}{27}\right)$ $f(1) = -(1)^3 + 10(1)^2 - 17(1) - 28 \quad \therefore \text{B}(1; -36)$	✓derivative/*afgeleide* ✓derivative/*afgeleide* = 0 ✓ factors/*faktore* ✓ *x*-values/*x-waarde* ✓coordinates of C/ *koördinate van C* ✓coordinates of B/ *koördinate van B* (6)

9.3	$f^{//}(x) = -6x + 20$ $0 = -6x + 20$ $x = \frac{10}{3}$ *or* $3\frac{1}{3}$ f is concave up for/ $x < \frac{10}{3}$ *f konkaaf na bo vir*	✓ 2nd derivative/ *2de afgeleide* ✓ x-value/x-*waarde* ✓✓ answer/*antwoord* (4)
9.4	$p < -36$	✓✓ answer/*antwoord* (2)
		[13]

QUESTION/*VRAAG 10*



	TW = UV = $x - 6$ TU = WV = $y - 6$ $2x + 2y = 70$ $\therefore\ y = 35 - x$ Area of/*Oppvl van* TWUV= TW.TU $A = (x-6)(y-6)$ $= (x-6)(35-x-6)$ $= (x-6)(29-x)$ $= -x^2 + 35x - 174$ $-2x + 35 = 0$ or/*of* $x = \frac{-35}{2(-1)}$ $x = 17\frac{1}{2}$ $\therefore$ Maximum area/ *Maksimum area* = $-\left(\frac{35}{2}\right)^2 + 35\left(\frac{35}{2}\right) - 174$ = 132,25 cm^2	✓ TW and/*en* TU ✓equation/*vergelyking* ✓ area i.t.o./*oppvl i.t.v.* *x* and/*en y* ✓ subst *y/vervang y* ✓ standard form/ *standard vorm* ✓$A^{/} = 0$ or subst into formula/*of vervang in formule* ✓ value of *x/waarde of x* ✓answer/*antwoord* (8)
		[8]

QUESTION/*VRAAG 11*

11.1.1(a)	$P(T \text{ or } C)' = 1 - 0{,}8 = 0{,}2$ $P(T \text{ of } K)' = 1 - 0{,}8 = 0{,}2$	✓ 0,2 (1)
11.1.1(b)	$P(T \text{ and } C) = P(T) + P(C) - P(T \text{ or } C)$ $= 0{,}4 + 0{,}5 - 0{,}8$ $= 0{,}1$ $P(T \text{ en } K) = P(T) + (P)K - P(T \text{ of } K) = 0{,}1$	✓ substitution/ *vervanging* ✓ answer/*antwoord* (2)
11.1.2	No/*Nee* $P(T \text{ and/en } C) \neq 0$	✓ No/*Nee* ✓ Reason/*Rede* (2)
11.2.1	7! = 5 040	✓7! ✓5040 (2)
11.2.2	$5! \times 3! = 720$	✓ 5! ✓3! ✓ answer/*antwoord* (3)
11.2.3	Palesa and/*en* Thandeka next to each other/*langs mekaar* = 6! × 2! Palesa and/*en* Thandeka not next to each other/*nie langs mekaar nie* = 5040 – 1440 = 3600 Probability/*Waarskynlikheid* = $\frac{3600}{5040} = \frac{5}{7} = 0{,}71$	✓ 6! ✓2! ✓subtraction/*aftrekking* ✓ answer/*antwoord* (4)
		[14]

TOTAL/*TOTAAL*: 150