basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATION/
SENIORSERTIFIKAAT-EKSAMEN

MATHEMATICS P1/*WISKUNDE V1*

2015

MEMORANDUM

MARKS/*PUNTE*: 150

Approved 13/06/2015

This memorandum consists of 22 pages./
Hierdie memorandum bestaan uit 22 bladsye.

DEPARTMENT OF BASIC EDUCATION
2015 -06- 10
PRIVATE BAG X895 PRETORIA

Approved. 11/6/2015
2015-06-11

Please turn over/*Blaai om asseblief*

NOTE:

- If a candidate answers a QUESTION TWICE, only mark the FIRST attempt.
- Consistent accuracy applies in all aspects of the marking memorandum.
- Once a candidate has reached 2 errors: stop marking.

LÈT WEL:

- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.*
- *Volgehoue akkuraatheid is DEURGAANS op ALLE aspekte van die memorandum van toepassing.*
- *Indien 'n kandidaat twee foute begaan het hou op merk.*

QUESTION/*VRAAG 1*

1.1.1	$x(x-1)=0$ $x=0$ or $x=1$	✓$x=0$ ✓$x=1$ (2)
1.1.2	$2x^2-4x-5=0$ $x=\dfrac{-(-4)\pm\sqrt{(-4)^2-4(2)(-5)}}{2(2)}$ $=\dfrac{4\pm\sqrt{56}}{4}$ $x=-0,87$ or $x=2,87$ **OR/*OF*** $x^2-2x-\dfrac{5}{2}=0$ $(x-1)^2=\dfrac{5}{2}+1$ $x-1=\pm\sqrt{\dfrac{7}{2}}$ $\therefore x=1\pm\sqrt{\dfrac{7}{2}}$ $x=-0,87$ or $x=2,87$	✓ correct substitution into correct formula ✓✓ answers (3) ✓completing the square/ *voltooiing van die vierkant* ✓✓answers (3)
1.1.3	$5^x=\dfrac{1}{125}$ $5^x=5^{-3}$ $x=-3$ **OR/*OF***	✓5^{-3} ✓ answer (2)

$5^x = \frac{1}{125}$

$\left(\frac{1}{5}\right)^{-x} = \left(\frac{1}{5}\right)^3$

$-x = 3$

$x = -3$

✓$\left(\frac{1}{5}\right)^{-x} = \left(\frac{1}{5}\right)^3$
✓answer
(2)

OR / *OF*

$5^x = \frac{1}{125}$

$x = \log_5\left(\frac{1}{125}\right)$

$= -3$

✓use of logs
✓ answer
(2)

OR / *OF*

$5^x = \frac{1}{125}$

$5^x \cdot 125 = 1$

$5^x \cdot 5^3 = 1$

$5^{x+3} = 5^0$

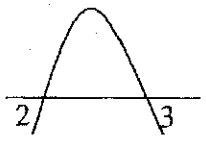
$x + 3 = 0$

$x = -3$

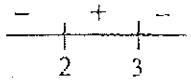
✓5^3

✓ answer
(2)

1.1.4 $(x - 3)(2 - x) > 0$



OR/*OF*



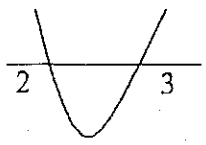
$2 < x < 3$

✓critical values
✓ solves an equality
✓ answer
(3)

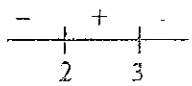
OR/*OF*

$(x - 3)(2 - x) > 0$

$(x - 3)(x - 2) < 0$



OR/*OF*



$2 < x < 3$

✓critical values
✓ $2 < x$
✓ $x < 3$
(3)

1.2.1	$x = 3$	✓answer (1)
1.2.2	$x+1=\frac{-4}{x-3}$ $(x+1)(x-3)=-4$ $(x+1)(x-3)+4=0$ $x^2-2x+1=0$ $(x-1)^2=0$ $x=1$	✓$(x+1)(x-3)=-4$ ✓standard form ✓factors ✓answer (4)
1.2.3	Yes, the graph of f and the graph of g have equal roots at $x = 1$. *Ja, die grafiek van f en die grafiek van g het gelyke wortels by* $x = 1$. **OR/*OF*** Yes, the graphs of f and g intersect in only one point, which is at $x = 1$. */Ja die grafieke van f en g sny in slegs een punt wat by* $x = 1$ is.	✓yes ✓reason (2) ✓yes ✓reason (2)

1.3

A ⟶ B

Speed/*Spoed* = y km/h
Distance/*Afstand* = x km
Time/*Tyd* = $\frac{x}{y}$

✓time from A to B is $\frac{x}{y}$

A ⟵ B

Speed/*Spoed* = $\frac{3y}{2}$ km/h
Distance/*Afstand* = x km
Time/*Tyd* = $\frac{x}{\frac{3y}{2}} = \frac{2x}{3y}$

✓time from B to A is $\frac{2x}{3y}$

OR/*OF*

	S	D	T
A to/*na* B	y	x	$\frac{x}{y}$
B to/*na* A	$\frac{3y}{2}$	x	$\frac{2x}{3y}$

Average speed travelled/*Gemiddelde spoed afgelê*:

$$\frac{\text{Total distance travelled/}\textit{Totale afstand gereis}}{\text{Total time taken/}\textit{Totale tyd geneem}} = \frac{2x}{\frac{x}{y}+\frac{2x}{3y}}$$

✓ $2x$

✓ $\frac{x}{y}+\frac{2x}{3y}$

$$= \frac{2x}{\frac{3x+2x}{3y}}$$

$$= \frac{6xy}{5x}$$

✓$\frac{6xy}{5x}$

$$= \frac{6y}{5} \text{ km/h}$$

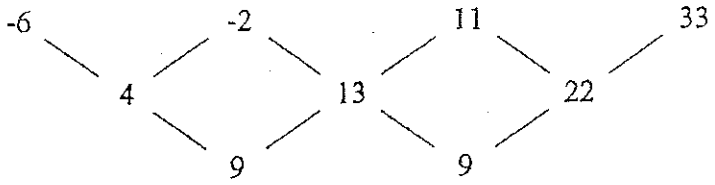
✓$\frac{6y}{5}$ km/h

(6)
[23]

QUESTION/*VRAAG 2*

2.1	$T_4 = 31$	✓answer (1)
2.2	$T_n = 9n - 5$ **OR/*OF*** $T_n = a + (n-1)d$ $= 4 + (n-1)(9)$ $= 9n - 5$	✓$9n$ ✓-5 (2) ✓4 ✓$(n-1)(9)$ (2)
2.3	$4; 22; 40.....$ $a = 4$ $d = 18$ $S_{25} = \frac{n}{2}[2a + (n-1)d]$ $= \frac{25}{2}[2(4) + (24)(18)]$ $= \frac{25}{2}(440)$ $= 5500$ **OR/*OF*** $T_{25} = 9(49) - 7$ $= 436$ $S_{25} = \frac{25}{2}[4 + 436]$ $= 5500$ **OR/*OF*** $4 + 22 + 40 + 58 + 76 + 94 + 112 + 130 + 148 + 166 + 184 + 202 + 220 + 238 +$ $256 + 274 + 292 + 310 + 328 + 346 + 364 + 382 + 400 + 418 + 436$ $= 5500$	✓✓$d = 18$ ✓correct substitution into correct formula ✓answer (4) ✓✓$T_{25} = 436$ ✓substitution into correct formula ✓answer (4) ✓✓$T_{25} = 436$ ✓expands whole series ✓answer (4)

2.4



✓ sets up quadratic sequence

$2a = 9$ $\quad 3a + b = 4$ $\quad a + b + c = -6$

$a = \frac{9}{2}$ $\quad 3\left(\frac{9}{2}\right) + b = 4$ $\quad \frac{9}{2} - \frac{19}{2} + c = -6$

$b = -\frac{19}{2}$ $\quad c = -1$

✓ $a = \frac{9}{2}$
✓ $b = -\frac{19}{2}$
✓ $c = -1$

$T_n = \frac{9}{2}n^2 - \frac{19}{2}n - 1$

(4)

OR/OF

$T_n = T_1 + (n-1)d_1 + \frac{(n-1)(n-2)d_2}{2}$

$= -6 + (n-1)(4) + \frac{(n-1)(n-2)(9)}{2}$

$= -6 + 4n - 4 + \frac{9n^2 - 27n + 18}{2}$

$= \frac{9}{2}n^2 - \frac{19}{2}n - 1$

✓formula & substitution
✓ $a = \frac{9}{2}$
✓ $b = -\frac{19}{2}$
✓ $c = -1$

(4)

OR/OF

$T_n = an^2 + bn + c$

$2a = 9$

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

$T_1 = \left(\frac{9}{2}\right)(1)^2 + b(1) + c$

$-6 = \frac{9}{2} + b + c$ ... line1

$T_2 = \left(\frac{9}{2}\right)(2)^2 + b(2) + c$

$-2 = 18 + 2b + c$ ... line2

$4 = \frac{27}{2} + b$ ... line2 – line1

$b = \frac{-19}{2}$

$c = -1$

$T_n = \frac{9}{2}n^2 - \frac{19}{2}n - 1$

✓ sets up quadratic sequence
✓ $a = \frac{9}{2}$
✓ $b = -\frac{19}{2}$
✓ $c = -1$

(4)
[11]

QUESTION/*VRAAG 3*

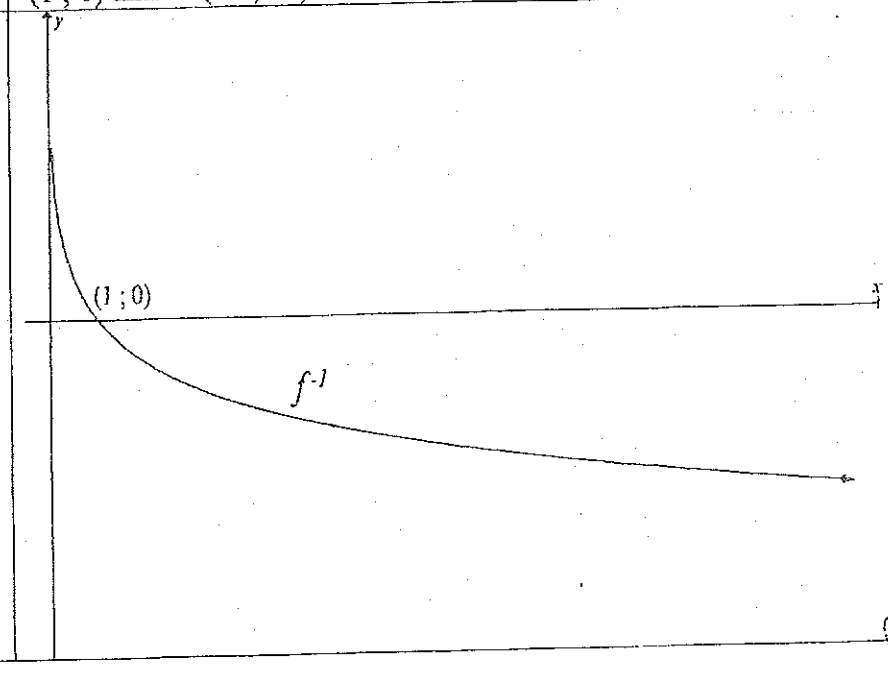
3.1	Given $\sum_{p=4}^{21}(-3)^p$	
3.1.1	$T_1=(-3)^4=81$ $T_2=(-3)^5=-243$ $T_3=(-3)^6=729$	✓81 ✓-243 and 729 (2)
3.1.2	$r=-3$	✓answer (1)
3.1.3	$\sum_{p=4}^{\infty}(-3)^p$ will NOT converge/*sal NIE konvergeer.* To converge/*om te konvergeer*, $-1<r<1$ and $r=-3$ **OR/*OF*** $\sum_{p=4}^{\infty}(-3)^p$ will NOT converge/*sal NIE konvergeer.* Because/*Omdat* $r<-1$	✓NOT converge/ *NIE konvergeer* ✓we do not have $-1<r<1$ (2) ✓NOT converge/ *NIE konvergeer* ✓ $r<-1$ (2)
3.1.4	$S_{18}=\frac{81x\left(1-(-3)^{18}\right)}{1-(-3)}$ $=-7845264882x$ **OR/*OF*** $S_{18}=\frac{81x\left((-3)^{18}-1\right)}{(-3)-1}$ $=-7845264882x$	✓ $n=18$ ✓ $a=81x$ ✓ correct substitution into correct formula (3) ✓ $n=18$ ✓ $a=81x$ ✓ correct substitution into correct formula (3)
3.2.1	$6-x;\ 5;\ \sqrt{4x+12}$ $5-(6-x)=\sqrt{4x+12}-5$ $x-1=\sqrt{4x+12}-5$ $x+4=\sqrt{4x+12}$ (and $x\geq-4$ and $x\geq-3$) $x^2+8x+16=4x+12$ $x^2+4x+4=0$ $(x+2)^2=0$ $x=-2$	✓ $T_2-T_1=T_3-T_2$ ✓ $x+4=\sqrt{4x+12}$ ✓ $x^2+8x+16=4x+12$ ✓ factorisation ✓ answer (5)

3.2.2	$T_1 = 6-(-2) = 8$ $T_2 = 5$ $T_3 = \sqrt{4(-2)+12}$ $= 2$ $d = -3$ $T_{10} = 8+9(-3)$ $= -19$	✓ $d = -3$ ✓ correct substitution into correct formula ✓ answer (3) [16]

QUESTION/*VRAAG 4*

4.1	R , $y \neq -2$ **OR/*OF*** $(-\infty;-2)\cup(-2;\infty)$	✓✓ $y \neq -2$ (2) ✓ $(-\infty;-2)$ ✓ $(-2;\infty)$ (2)
4.2	$g(x) = \frac{a}{x-1} - 2$ $-5 = \frac{a}{-1} - 2$ $5 = a+2$ $a = 3$	✓substitution of the point (0; –5) in to $g(x)$ ✓answer (2)
4.3	For g, asymptotes intersect at/*Vir g, asimptote sny by* $(1;-2)$ ∴ For/*Vir* $y = g(x-3)+7$, asymptotes will intersect at/ *asimptote sal sny by* $(1+3;-2+7)$ i.e./*d.i.* at/*by* $(4;5)$ **OR/*OF*** $g(x) = \frac{a}{x-1} - 2$ $y = g(x-3)+7$ $= \frac{3}{x-3-1} - 2+7$ $= \frac{3}{x-4} + 5$ $(4;5)$	✓ $(1;-2)$ for g ✓ $x = 4$ ✓ $y = 5$ (3) ✓subs ✓ $x = 4$ ✓ $y = 5$ (3) [7]

QUESTION/*VRAAG 5*

5.1	$y=\left(\frac{1}{4}\right)^{-2}$ $=4^2$ $=16$	✓substitution ✓ answer (2)
5.2	$y=\left(\frac{1}{4}\right)^{x}$ $f^{-1}: x=\left(\frac{1}{4}\right)^{y}$ $y=\log_{\frac{1}{4}} x$ or $y=-\log_4 x$	✓interchange x and y ✓ answer (2)
5.3	f and f^{-1} are symmetrical about the line $y = x$, to obtain f^{-1}, reflect f in the line $y = x$. *f en f^{-1} is simmetries om die lyn $y = x$, om dus f^{-1} te kry reflekteer f in die lyn $y = x$.* **OR/*OF*** The x and y-coordinates of points on f may be swopped around to obtain the coordinates of the points on f^{-1}. Two points that lie on the graph of f are (0 ; 1) and (–2 ; 16). The corresponding points that will lie on f^{-1} will therefore be (1 ; 0) and (16 ; –2). *Die x- en y-koördinate van punte op f mag omgeruil word om die koördinate van punte op f^{-1} te kry. Twee punte op die grafiek van f is* (0 ; 1) *en* (–2 ; 16). *Die ooreenstemmende punte op f^{-1}* sal dus (1 ; 0) and/*en* (16 ; –2) *wees.*	✓reflect in $y = x$ (1) ✓swop x and y (1)
5.4		✓ shape of f^{-1} ✓x-int of f^{-1} at 1 (2)

5.5	$x>0$ OR/*OF* $(0;\infty)$	✓ $x>0$ (1) ✓ $(0;\infty)$ (1)
5.6	$f^{-1}(x)\geq -2$ From 5.1, $f^{-1}(16)=-2$ $0<x\leq 16$ or $x\in(0;16]$	✓ $x>0$ ✓ $x\leq 16$ (2)
5.7.1	$q=\frac{1}{2}$ (using a calculator/*gebruik 'n sakrekenaar*) **OR/*OF*** Without a calculator (not necessary)/*Sonder sakrekenaar (nie nodig)* $q=\log_{\frac{1}{4}}\frac{1}{2}$ $\frac{1}{4}^{q}=\frac{1}{2}$ $2^{-2q}=2^{-1}$ $2q=1$ $q=\frac{1}{2}$ **OR/*OF*** $q=\log_{\frac{1}{4}}\frac{1}{2}$ $q=\frac{\log\frac{1}{2}}{\log\frac{1}{4}}$ $q=\frac{-\log 2}{-2\log 2}$ $q=\frac{1}{2}$	✓ $q=\frac{1}{2}$ (1) ✓ $q=\frac{1}{2}$ (1)
5.7.2	At the intersection point of f and f^{-1}, $y=x$ (by symmetry). Thus need only solve $f^{-1}(x)=x$ (instead of $f(x)=f^{-1}(x)$) *By die snypunt van f en f^{-1}, $y=x$ (deur simmetrie).* *Slegs nodig om $f^{-1}(x)=x$ op te los (in plaas van $f(x)=f^{-1}(x)$* $\log_{\frac{1}{4}}x=x$ $\log_{\frac{1}{4}}\frac{1}{2}=\frac{1}{2}$ from 5.7.1 $x=\frac{1}{2}$ $y=\frac{1}{2}$ $\left(\frac{1}{2};\frac{1}{2}\right)$ **OR/*OF*** By/*Van* 5.7.1, $\frac{1}{2}=\log_{\frac{1}{4}}\frac{1}{2}$ Which means that $\left(\frac{1}{2};\frac{1}{2}\right)$ lies on the graph of f^{-1}./	✓ $\frac{1}{2}=\log_{\frac{1}{4}}\frac{1}{2}$ ✓ $x=\frac{1}{2}$ ✓ $y=\frac{1}{2}$ (3) ✓ $\frac{1}{2}=\log_{\frac{1}{4}}\frac{1}{2}$

	Wat beteken $\left(\frac{1}{2};\frac{1}{2}\right)$ *lê op die grafiek van* f^{-1} But clearly, $\left(\frac{1}{2};\frac{1}{2}\right)$ lies on $y=x$ /*Maar,* $\left(\frac{1}{2};\frac{1}{2}\right)$ *lê op* $y=x$ Hence $\left(\frac{1}{2};\frac{1}{2}\right)$ is the intersection point of f and f^{-1} /*Dus is* $\left(\frac{1}{2};\frac{1}{2}\right)$ *die snypunt van* f *en* f^{-1}	✓ $x=\frac{1}{2}$ ✓ $y=\frac{1}{2}$ (3) **[14]**

QUESTION/*VRAAG 6*

6.1	$-3x^2-9x+30=0$ $x^2+3x-10=0$ $(x+5)(x-2)=0$ $x=-5$ or $x=2$ AB = 7 units	✓ $-3x^2-9x+30=0$ ✓factors ✓answers ✓AB = 7 (4)
6.2	$-3x^2-9x+30=-12x+12$ $-3x^2+3x+18=0$ $x^2-x-6=0$ $(x-3)(x+2)=0$ $x=-2$ or $x=3$ At K, $x>0$, hence $y=-12(3)+12=-24$ K$(3;-24)$	✓equating of equations ✓ $x^2-x-6=0$ ✓factors ✓$x=3$ ✓$y=-24$ (5)
6.3	$f(x)\le g(x)$ $x\le -2$ or $x\ge 3$ **OR/*OF*** $f(x)\le g(x)$ $x\in(-\infty;-2]$ or $[3;\infty)$ **OR/*OF*** $-3x^2-9x+30-(-12x+12)\le 0$ $-3x^2+3x+18\le 0$ $x^2-x-6\ge 0$ $(x-3)(x+2)\ge 0$ $x\le -2$ or $x\ge 3$	✓ $x\le -2$ ✓ $x\ge 3$ ✓ or (3) ✓ $(-\infty;-2]$ ✓ $[3;\infty)$ ✓ or (3) ✓ $x\le -2$ ✓ $x\ge 3$ ✓ or (3)

6.4	$CD = -3x^2 - 9x + 30 - (-12x + 12)$ $= -3x^2 + 3x + 18$	✓ $CD = y_f - y_g$ ✓ $-3x^2 + 3x + 18$
	$x = -\frac{b}{2a}$ **OR/*OF*** $f'(x) = 0$ **OR/*OF*** $CD = -3(x^2 - x) + 18$ $= \frac{-3}{2(-3)}$ $-6x + 3 = 0$ $= -3\left[\left(x - \frac{1}{2}\right)^2 - \left(\frac{1}{2}\right)^2\right] + 18$ $= \frac{1}{2}$ $x = \frac{1}{2}$ $= -3\left(x - \frac{1}{2}\right)^2 + \frac{3}{4} + 18$ $= -3\left(x - \frac{1}{2}\right)^2 + 18\frac{3}{4}$	✓method ✓ $x = \frac{1}{2}$
	Max length/*Maks lengte* CD **OR/*OF*** Max length/*Maks lengte* CD $= -3\left(\frac{1}{2}\right)^2 + 3\left(\frac{1}{2}\right) + 18$ $= 18\frac{3}{4}$ $= \frac{75}{4}$ $= 18\frac{3}{4}$	✓max length $CD = \frac{75}{4}$ or $18\frac{3}{4}$ (5) [17]

QUESTION/*VRAAG 7*

7.1	Anisha: Final investment value/*Finale beleggingswaarde* $= P(1 + in) + 7{,}5\%$ of R12 000 $= 12\,000(1 + 0{,}085 \times 5) + 900$ $=$ R18 000	✓900 or 7,5% of R12 000 ✓$12000(1 + 0{,}085 \times 5)$ ✓R18 000
	Lindiwe: Final investment value /*Finale beleggingswaarde* $= P(1 + i)^n$ $= 12\,000\left(1 + \frac{0{,}085}{4}\right)^{20}$ $=$ R18 273,54	✓$12\,000\left(1 + \frac{0{,}085}{4}\right)^{20}$ ✓R18273,54
	Therefore Lindiwe will have a larger final amount./ *Lindiwe sal 'n groter finale bedrag hê.*	✓conclusion (6)

Please turn over/*Blaai om asseblief*

7.2	$A = P(1-i)^n$ $41\ 611,57 = 120000(1-0,124)^n$ $\frac{41\ 611,57}{120\,000} = (0,876)^n$ $n = \log_{(0,876)} \frac{41611,57}{120000}$ $= 8$ years **OR/*OF*** $A = P(1-i)^n$ $41611,57 = 120000(1-0,124)^n$ $\frac{41611,57}{120000} = (0,876)^n$ $\log\frac{41611,57}{120000} = n\log(0,876)^n$ $n = \frac{\log\frac{41611,57}{120000}}{\log 0,876}$ $= 8$ years	✓formula ✓substitution ✓ $n = \log_{(0,876)} \frac{41611,57}{120000}$ ✓answer (4) ✓formula ✓substitution ✓ $n = \frac{\log\frac{41611,57}{120000}}{\log 0,876}$ ✓answer (4)
7.3	final amount / *finale bedrag* $= P(1+i)^n + \frac{x\left[(1+i)^n - 1\right]}{i}$ $= 5000\left(1+\frac{0,15}{12}\right)^{24} + \frac{800\left[\left(1+\frac{0,15}{12}\right)^{24} - 1\right]}{\frac{0,15}{12}}$ $= 6736,755 + 22\ 230,467$ $= R28\ 967,22$	✓ $i = \frac{0,15}{12}$ ✓ $n = 24$ ✓(subs) ✓(adding) $5000\left(1+\frac{0,15}{12}\right)^{24} + \frac{800\left[\left(1+\frac{0,15}{12}\right)^{24} - 1\right]}{\frac{0,15}{12}}$ ✓ answer (5) **[15]**

QUESTION/*VRAAG 8*

8.1

$$f(x+h)=\frac{4}{x+h}$$

$$f(x+h)-f(x)=\frac{4}{x+h}-\frac{4}{x}$$

$$=\frac{4x-4(x+h)}{x(x+h)}$$

$$=\frac{4x-4x-4h}{x(x+h)}$$

$$=\frac{-4h}{x(x+h)}$$

$$\frac{f(x+h)-f(x)}{h}=\frac{\frac{-4h}{x(x+h)}}{h}$$

$$=\frac{-4h}{xh(x+h)}$$

$$\frac{-4}{x(x+h)}$$

$$f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$$

$$=\lim_{h\to 0}\frac{-4}{x(x+h)}$$

$$=\frac{-4}{x^2}$$

✓$\frac{4}{x+h}-\frac{4}{x}$

✓$\frac{4x-4(x+h)}{x(x+h)}$

✓$\frac{-4}{x(x+h)}$

✓formula

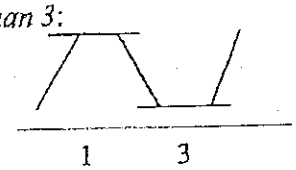
✓answer

(5)

OR/*OF*

	$f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$ $=\lim\limits_{h\to 0}\dfrac{\frac{4}{x+h}-\frac{4}{x}}{h}$ $=\lim\limits_{h\to 0}\dfrac{\frac{4x-4(x+h)}{x(x+h)}}{h}$ $=\lim\limits_{h\to 0}\dfrac{4x-4x-4h}{hx(x+h)}$ $=\lim\limits_{h\to 0}\dfrac{-4h}{xh(x+h)}$ $=\lim\limits_{h\to 0}\dfrac{-4}{x(x+h)}$ $=\dfrac{-4}{x^2}$	✓formula ✓subst. into formula $\checkmark\dfrac{4x-4(x+h)}{x(x+h)}$ $\checkmark\dfrac{-4}{x(x+h)}$ ✓answer (5)
8.2.1	$y=5x^2+5x+2$ $\dfrac{dy}{dx}=10x+5$	✓$10x$ ✓5 (2)
8.2.2	$D_x\left[\sqrt[3]{x^2}-\frac{1}{2}x\right]$ $=D_x\left[x^{\frac{2}{3}}-\frac{1}{2}x\right]$ $=\frac{2}{3}x^{\frac{-1}{3}}-\frac{1}{2}$	✓$x^{\frac{2}{3}}$ $\checkmark\frac{2}{3}x^{\frac{-1}{3}}$ $\checkmark-\frac{1}{2}$ (3)
8.3	$p(x)=x^3+2x$ $p'(x)=3x^2+2$ $3x^2\geq 0$ or / *of* $x^2\geq 0$ for all/*vir alle* $x\in\mathbb{R}$ $\therefore 3x^2+2\geq 2>0$ for all/*vir alle* $x\in\mathbf{R}$ i.e. $p'(x)>0$ for all/*vir alle* $x\in\mathbf{R}$ i.e. all tangents to p have gradient greater than (or equal to) 2. Thus there is no tangent to p that has negative gradient. *Alle raaklyne aan p sal dus 'n gradiënt groter (of gelyk aan) 2 hê. Daar sal dus geen raaklyn aan p wees met 'n negatiewe gradiënt nie.*	✓$p'(x)=3x^2+2$ ✓states & justifies $p'(x)>0$ ✓linking derivative to gradient of tangent/*verband tussen gradiënt en afgeleide* (3) [13]

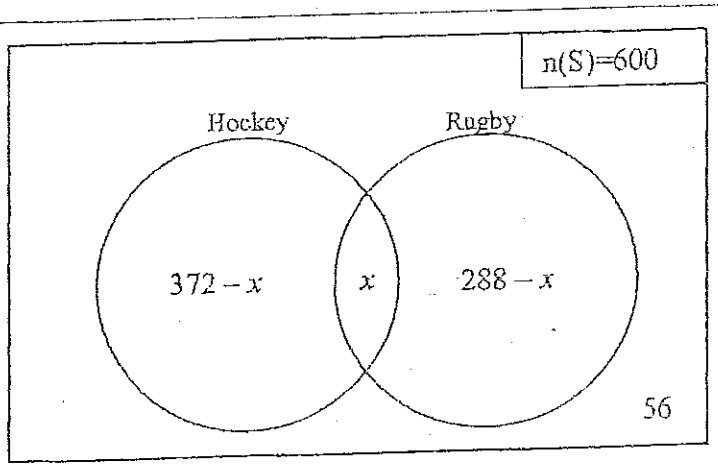
QUESTION/*VRAAG 9*

9.1	$x=1$ or $x=3$	✓ $x=3$ ✓ $x=1$ (2)
9.2	$1<x<3$	✓✓answer (2)
9.3	For a point x close to 3/*Vir 'n punt naby aan 3*: If $x<3$, $f'(x)<0 \Rightarrow f$ decreasing/*dalend* If $x>3$, $f'(x)>0 \Rightarrow f$ increasing/*stygend* Therefore: f has a local minimum at/*f het lokale minimum by* $x=3$  **OR/*OF*** At $x=3$, the gradient function changes from negative to positive therefore the function will have a local minimum point at $x=3$/ *By* $x=3$ *verander die gradiëntfunksie van negatief na positief dus sal die funksie 'n lokale minimum punt hê by* $x=3$. **OR/*OF*** $f'(3)=0$ and $f''(3)>0$ therefore the function will have a local minimum point at $x=3$ / $f''(3)>0$ *dus sal die funksie 'n lokale minimum punt hê by* $x=3$.	✓ f dec for $x<3$ *f dalend vir* $x<3$ f incr for $x>3$ *f stygend vir* $x>3$ ✓ $x=3$ local min (2) ✓ at $x=3$ gradient changes from neg to pos ✓ $x=3$ local min (2) ✓ $f''(3)>0$ ✓ $x=3$ local min (2)
9.4	$f''(x)=0$ at the turning point of/*by die draaipunt van* $f'(x)$ Using symmetry/*Deur simmetrie* $x=\frac{1+3}{2}$ $=2$	✓answer (1)
9.5	Concave up if/*Konkaaf op as* $f''(x)>0$ $x>2$	✓ $f''(x)>0$ ✓answer (2) [9]

QUESTION/*VRAAG 10*

	Given: $M(t)=t^3-9t^2+3000 \quad ; \quad 0\le t\le 30$	
10.1	$M(0)=0^3-9(0)^2+3000$ $=3000g$ or $3kg$	✓answer (1)
10.2	$t^3-9t^2+3000=3000$ $t^3-9t^2=0$ $t^2(t-9)=0$ $t=0$ or $t=9$ Baby's mass will return to the birth mass on the 9th day/ *Baba se massa keer terug na massa by geboorte op die 9de dag.*	✓$M(t)=3000$ ✓$t^3-9t=0$ ✓factors ✓$t=9$ (4)
10.3	$M'(t)=0$ $3t^2-18t=0$ $3t(t-6)=0$ $t=0$ or $t=6$ Baby's mass will be a minimum on the 6th day/ *Baba se massa sal 'n minimum wees op die 6de dag.*	✓$M'(t)=0$ ✓$3t^2-18t$ ✓factors ✓$t=6$ (4)
10.4	$M'(t)=3t^2-18t$ $M''(t)=6t-18$ $0=6t-18$ $t=3$ **OR / *OF*** Using symmetry/*Deur simmitrie*: $t=\frac{0+6}{2}$ $=3$	✓$6t-18$ ✓answer (2) ✓$\frac{0+6}{2}$ ✓answer (2) **[11]**

QUESTION/*VRAAG 11*

11.1.1		✓ $372-x$ for Hockey only ✓ $288-x$ for Rugby only ✓ 56 outside of Hockey & Rugby (3)
11.1.2	$(372-x)+x+(288-x)+56=600$ $716-x=600$ $x=116$ **OR/*OF*** $n(\text{H or R})=600-56$ $=544$ $n(\text{H or R})=n(\text{H})+n(\text{R})-n(\text{H and R})$ $544=372+288-x$ $x=372+288-544$ $=116$	✓ setting up the equation ✓ answer (2) ✓ setting up the equation ✓ answer (2)
11.1.3	No, they are not mutually exclusive. There is an intersection between the two sets/ *Nee, hul is nie onderling uitsluitend nie.* *Daar is 'n snyding tussen die twee stelle*	✓ No ✓ justification (2)
11.2.1	$5!=120$	✓ answer (1)
11.2.2	$1\times 2!\times 3!$ $=12$	✓ $2!$ ✓ $3!$ ✓ answer (3)
11.2.3	$\frac{5!\times 6!\times 2}{11!}$ $=\frac{1}{231}$	✓ $5!\times 6!\times 2$ ✓ division by $11!$ ✓ answer (3) [14]
	TOTAL/*TOTAAL*:	150

ADDENDUM TO THE MEMORANDUM

QUESTION 1

1.1.1 no CA marks, both marks are for accuracy only

1.1.2 No penalty if candidate writes 4^2 instead of $(-4)^2$ in the substitution into the formula.
Penalise one mark for incorrect rounding in this question.
If the candidate leaves the answers in surd form, award max 1/3 marks.
Answers only: award full marks

1.1.3 Answer only: full marks
If candidate says $5^x = 5^3$ and then $x = 3$, award 1/2 marks

1.1.4 Answer only: award full marks
If candidate says the following (and no breakdown has occurred):

- $x > 2$ and $x > 3$, award 1/3 marks
- $x < 2$ and $x < 3$, award 1/3 marks
- $x < 2$ or $x > 3$, award 2/3 marks
- $x > 2$ and $x < 3$, award 3/3 marks
- $x > 2$ or $x < 3$, award 2/3 marks

Accept graphical solution (provided it is all labelled correctly and the number line is indicated)
Accept correct interval notation

1.2.2 All marks except first mark are CA
If candidate makes the equation linear, this is a breakdown. Award max 1/4 marks (the one mark is allowed for correctly multiplying through by the denominator)
Answer only: award 1/4 marks
If the candidate assumes $x = 1$ and substitutes into f and g, award 1 mark only.

1.2.3 Must be marked CA from 1.2.2 (so a candidate who gets two distinct answers for 1.2.2 must answer 'no' to be awarded marks.)
The mark for yes can be awarded even if no reason is given.

QUESTION 2

2.2 If the answer is left as $T_n = 4 + (n-1)(9)$: award 2/2 marks

2.3 Answer mark is CA, provided that formula is correct.
If candidates calculate S_{25} with $d = 9$, answer is 2800. Award maximum 2/4 marks.

2.4 Answer only: full marks

QUESTION 3

3.1.1 If candidate starts with $p = 1$ (instead of 4) award zero marks

3.1.4 Answer only: full marks
The answer does not have to be simplified.
If the candidate omits the 'x' award 2/3 marks

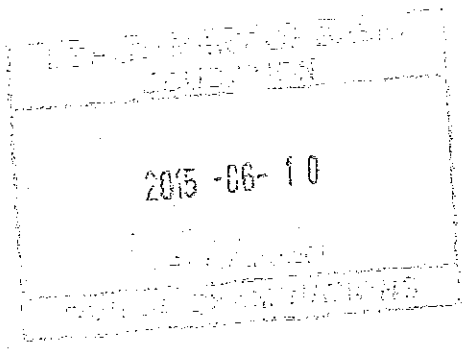
3.2.1 Candidates who make the mistake of omitting $8x$ i.e. writes $x^2 + 16 = 4x + 12$. will get $x = 2$. Award maximum 3/5 marks

3.2.2 If the candidate reached answer of $x = 2$ in 3.2.1, award zero marks for 3.2.2
If the candidate could not solve 3.2.1 but then (correctly) calculates d in terms of x and correctly substitutes a and d in terms of x into T_{10} formula, award maximum 2/3 marks.

QUESTION 4

4.1 If the candidate answers $y \neq -2$: award full marks
The only time a candidate can get 1/2: if the candidate answers $y \neq 1$

4.3 Answer only: full marks
No penalty if answer is not given in coordinate form.



QUESTION 5

5.1 Answer only: full marks
5.2 Answer only: full marks
5.7.2 Answer only: full marks

QUESTION 6

6.1 No penalty if candidate has not written " =0 "
6.2 CA for x only if x is positive
CA for y only if y is negative
6.3 Answer only: full marks
If the candidate swaps f and g and does the question algebraically: Award 0 /3 marks

QUESTION 7

7.1 Mark for R18 000 is awarded only if correct formula used.
Mark the R18273,54 as CA if the candidate has used compound interest formula
(if quarterly concept is ignored, candidate will get an answer of R18043,88 for Lindiwe)

7.2 Answer only: full marks
If candidate switches A and P around and then gets an answer of –8 years: award max 2/4 marks (for formula and logs)
If the candidate takes log of a negative: this constitutes a breakdown.

7.3 No CA marking in this question for the final mark.

QUESTION 8

Penalise candidates a maximum of one mark (overall) for notation error in 8.1 and 8.2

8.2.2 CA on second mark only if the exponent is a fraction
If candidate differentiates $-\frac{1}{2}x$ twice, do NOT award the mark for $-\frac{1}{2}$

QUESTION 9

9.2 If candidate uses $\leq$ symbols: award maximum 1/2 marks (because the question asked for *strictly* decreasing)

9.3 if graph / diagram is given without explanation, award full marks if candidates indicates the 1 and 3 as being the x-values at the turning points.

9.4 CA from 9.1

9.5 CA from 9.4
Answer only: full marks

QUESTION 10

10.1 No penalty for units if candidate give 3000.
If candidate converts to 3kg, units must be given.

10.2 Answer only: 1/4 marks
If candidate says $t = 9$ and shows substitution into $M(t)$ i.e. $M(9) = 3000$: full marks.

10.3 Answer only: award 1/4 marks

10.4 CA from 10.3
Accept trial and error, provided that this is shown in detail, such as:

T	$M'(t)$
0	0
1	–15
2	–24
3	–27
4	–24
5	–15
6	0

Therefore baby's mass is decreasing the fastest at $t = 3$ / *Die baba se massa verminder die meeste wanneer* $t = 3$

✓method
✓answer (2)

QUESTION 11

11.1.2 Answer only: full marks

11.1.3 Award the mark for 'no' independent of the justification.

11.2.1 Accept 5! or 120