basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

GRADE 12/*GRAAD* 12

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

MATHEMATICS P1/*WISKUNDE V1*

NOVEMBER 2016

MEMORANDUM

MARKS: 150
PUNTE: 150

This memorandum consists of 20 pages.
Hierdie memorandum bestaan uit 20 bladsye.

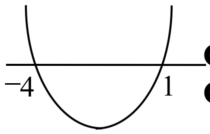
NOTE:
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent accuracy applies in all aspects of the marking memorandum.

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	$x(x-7)=0$ $x=0$ or $x=7$	✓ $x=0$ ✓ $x=7$ (2)
1.1.2	$x^2-6x+2=0$ $x=\frac{6\pm\sqrt{(-6)^2-4(1)(2)}}{2(1)}$ $x=\frac{6\pm\sqrt{28}}{2}$ $x=0{,}35$ or $x=5{,}65$ **OR/OF** $x^2-6x+2=0$ $x^2-6x+9=-2+9$ $(x-3)^2=7$ $x-3=\pm\sqrt{7}$ $x=3\pm\sqrt{7}$ $x=0{,}35$ or $x=5{,}65$	✓correct substitution into correct formula ✓ $x=0{,}35$ ✓ $x=5{,}65$ (3) ✓ $(x-3)^2=7$ ✓ $x=0{,}35$ ✓ $x=5{,}65$ (3)
1.1.3	$\sqrt{x-1}+1=x$ $\sqrt{x-1}=x-1$ $x-1=x^2-2x+1$ $x^2-3x+2=0$ $(x-2)(x-1)=0$ $x=2$ or $x=1$ Both answers are valid **OR/OF**	✓ isolate $\sqrt{x-1}$ ✓ x^2-2x+1 ✓ standard form ✓ factors ✓ both answers (5)

	$\sqrt{x-1}+1=x$ $\sqrt{x-1}=x-1$ Let $x-1=k$ $\sqrt{k}=k \quad k\geq 0$ $k=k^2$ $k^2-k=0$ $k(k-1)=0$ $(x-1)(x-2)=0$ $x=2$ or $x=1 \quad ; \quad x\geq 1$ Both answers are valid	✓ isolate $\sqrt{x-1}$ ✓ k^2 ✓ standard form ✓ factors ✓ both answers (5)
	OR/OF	
	$\sqrt{x-1}+1=x$ $\sqrt{x-1}=x-1$ By inspection : $x-1=0$ or $x-1=1$ $x=2$ or $x=1$	✓ isolate $\sqrt{x-1}$ ✓ $x-1=0$ ✓ $x-1=1$ ✓ $x=2$ ✓ $x=1$ (5)
1.1.4	$3^{x+3}-3^{x+2}=486$ $3^x3^3-3^x3^2=486$ $3^x(3^3-3^2)=486$ $3^x=27$ $3^x=3^3$ $x=3$	✓ expansion ✓ common factor ✓ $3^x=27$ ✓ $x=3$ (4)
	OR/OF	
	$3^{x+3}-3^{x+2}=486$ $3^{x+2}(3^1-1)=486$ $3^{x+2}=243$ $3^{x+2}=3^5$ $x+2=5$ $x=3$	✓ common factor ✓ (3^1-1) ✓ $3^{x+2}=243$ ✓ $x=3$ (4)
1.2.1	$f(x)=x^2+3x-4$ $0=(x+4)(x-1)$ $x=-4$ or $x=1$	✓ factors ✓ both answers (2)

1.2.2	$x^2+3x-4<0$ $(x+4)(x-1)<0$  **OR/ OF** $+ \;\; \vert \;\; - \;\; \vert \;\; +$ $-4 \qquad 1$ $-4<x<1$ **OR/*OF*** $x\in(-4\,;1)$	✓✓ $-4<x<1$ (2)
1.2.3	$2x+3\geq 0$ $x\geq -\frac{3}{2}$ $f'(x)\geq 0$ when f is increasing The turning point occurs at $x=\frac{-4+1}{2}$ $x\geq -\frac{3}{2}$	✓ $2x+3$ ✓ $x\geq -\frac{3}{2}$ (2) ✓ $x=\frac{-4+1}{2}$ ✓ $x\geq -\frac{3}{2}$ (2)
1.3	$x=2y$ and $x^2-5xy=-24$ $(2y)^2-5(2y)(y)=-24$ $4y^2-10y^2=-24$ $-6y^2=-24$ $y^2=4$ $y=-2$ or $y=2$ $x=-4$ or $x=4$ **OR/OF** $x=2y$ and $x^2-5xy=-24$ $y=\frac{x}{2}$ $x^2-5(x)\left(\frac{x}{2}\right)=-24$ $x^2-\frac{5}{2}x^2=-24$ $-\frac{3}{2}x^2=-24$ $x^2=16$ $x=-4$ or $x=4$ $y=-2$ or $y=2$ **OR/OF**	✓ substitution of $2y$ ✓ $-6y^2=-24$ ✓ both y – values ✓ both x– values (4) ✓ substitution of $\frac{x}{2}$ ✓ $-\frac{3}{2}x^2=-24$ ✓ both x – values ✓ both y – values (4)

	$x = 2y$ and $x^2 - 5xy = -24$ $y = \frac{x}{2}$ $y = \frac{-x^2 - 24}{-5x}$ $\frac{x}{2} = \frac{x^2 + 24}{5x}$ $5x^2 = 2x^2 + 48$ $3x^2 = 48$ $x^2 = 16$ $x = -4$ or $x = 4$ $y = -2$ or $y = 2$	✓ equating $\frac{x}{2} = \frac{x^2 + 24}{5x}$ ✓ $3x^2 = 48$ ✓ both x – values ✓ both y – values (4)
		[24]

QUESTION/*VRAAG* 2

2.1	$T_4 = -7$	✓ –7 (1)
2.2	$T_n = a + (n-1)d$ $-87 = 5 + (n-1)(-4)$ $-87 = 5 - 4n + 4$ $4n = 96$ $n = 24$ **OR/OF** $-4n + 9 = -87$ $-4n = -96$ $n = 24$	✓ $a = 5$ and $d = -4$ ✓ $-87 = 5 + (n-1)(-4)$ ✓ $n = 24$ (3) ✓ $-4n + 9$ ✓ $-4n + 9 = -87$ ✓ $n = 24$ (3)
2.3	$-3; -7; ....; -87$ $S_n = \frac{n}{2}[a + T_n]$ $S_{22} = \frac{22}{2}[-3 - 87]$ $= -990$ **OR/OF**	✓ $n = 22$ ✓ $a = -3$ ✓ answer (3)

	$-3\,;-7\,;.......;-87$ $S_n=\frac{n}{2}\left[2a+(n-1)d\right]$ $S_{22}=\frac{22}{2}\left[2(-3)+(22-1)(-4)\right]$ $=-990$	✓ $n=22$ ✓ $a=-3$ ✓ answer (3)
	OR/OF All negative terms can be written down and added to get the answer of –990./*Alle negatiewe terme kan neergeskryf word en dan bymekaar getel word om –990 te kry.*	✓ $a=-3$ ✓✓ answer (3)
	OR/OF Sum $=S_{24}-(5+1)$ $=\frac{24}{2}\left[5-87\right]-6$ $=-990$	✓ $\frac{24}{2}\left[5-87\right]$ ✓ -6 ✓ answer (3)
2.4	$5\,;-15\,;-35......$ $d=-20$ $T_n=-20n+25$ Last term in the sequence divisible by 5 is:/*Laaste term in die ry deelbaar deur* 5 *is:* $-4187+4(3)$ $=-4175$ $T_n=-20n+25$ $-4175=-20n+25$ $20n=4200$ $n=210$ There will be 210 terms in the sequence that is divisible by 5./*Daar is* 210 *terme in die ry deelbaar deur* 5. **OR/OF**	✓ $d=-20$ ✓ $T_n=-20n+25$ ✓ $-4175=-20n+25$ ✓ $n=210$ (4)

	5 ; 1 ; –3 ; ... ; –83 ; –87; ……; – 4187 $T_n = -4n+9$ $-4187 = -4n+9$ $4n = 4196$ $n = 1049$ There are 1049 terms in the sequence./*Daar is* 1049 *terme in die ry.* T_1 ; T_6 ; T_{11} ; T_{16} ... are divisible by 5./*is deelbaar deur* 5. The largest integer value of k such that $5k-4 \leq 1049$ $5k \leq 1053$ $k \leq 210{,}6$ $k = 210$ **OR/*OF*** **5** ; 1 –3 ; –7 ; … ; **–4175**; –4179 ;–4183 ; –4187 $T_n = a+(n-1)d$ $-4175 = 5+(n-1)(-4)$ $-4180 = -4(n-1)$ $n = 1046$ Number of terms divisible by 5 $= \frac{1046-1}{5}+1$ $= 210$	✓ $-4n+9 = -4187$ ✓ $n = 1049$ ✓ $5k-4 \leq 1049$ ✓ $k = 210$ (4) ✓ $d = -4$ ✓ $-4175 = -4n+9$ ✓ 1046 ✓ $n = 210$ (4) **[11]**

QUESTION/*VRAAG* 3

3.1.1	$-1 \quad ; \quad x \quad ; \quad 3 \quad ; \quad x+8\ ; ...$ $-1 \qquad x \qquad 3 \qquad x+8$ $x+1 \qquad 3-x \qquad x+5$ $-2x+2 \qquad 2x+2$ $-2x+2=2x+2$ $4x=0$ $x=0$	✓ $x+1; 3-x$ and $x+5$ ✓ calculating second differences ✓ $-2x+2=2x+2$ ✓ $x=0$ (4)
3.1.2	First differences/*Eerste verskille*: 1 ; 3 ; 5 ; …… $S_n=\frac{n}{2}\left[2(1)+(n-1)(2)\right]$ $=n^2$ $250<n^2$ $n>\sqrt{250}$ $\therefore n>15{,}8$ The sum of the 16 first differences will be greater than 250. Therefore the 17th term of the quadratic number pattern is the first satisfying this condition./*Die som van* 16 *eerste verskille sal groter as* 250 *wees. Gevolglik sal die 17de term van die kwadratiese getalpatroon die eerste wees wat aan die voorwaarde voldoen.*	✓ $S_n=n^2$ ✓ $S_n>250$ ✓ $n>15{,}8$ ✓ $n=17$ (4)
3.2.1	$21+21(0{,}85)+21(0{,}85)^2+.........$ $\mathrm{T_n}=ar^{n-1}$ $\mathrm{T_{10}}=(21)(0{,}85)^9$ $=4{,}86$ cm	✓ $n=10$; $r=0{,}85$ or $\frac{17}{20}$ ✓ substitution into correct formula ✓ answer (3)

3.2.2	$\mathrm{S_n}=\frac{a(1-r^n)}{1-r}$ $\mathrm{S_{15}}=\frac{21\left(1-(0{,}85)^{15}\right)}{1-0{,}85}$ $=127{,}77$ Area of the page = 30 x 21 = 630 Percentage of paper covered in grey ink: $=\frac{127{,}77}{630}\times 100\%$ $=20{,}28\%$	✓ $n=15$ ✓ 127,77 ✓ 630 ✓ 20,28 (4) **[15]**

QUESTION/*VRAAG* 4

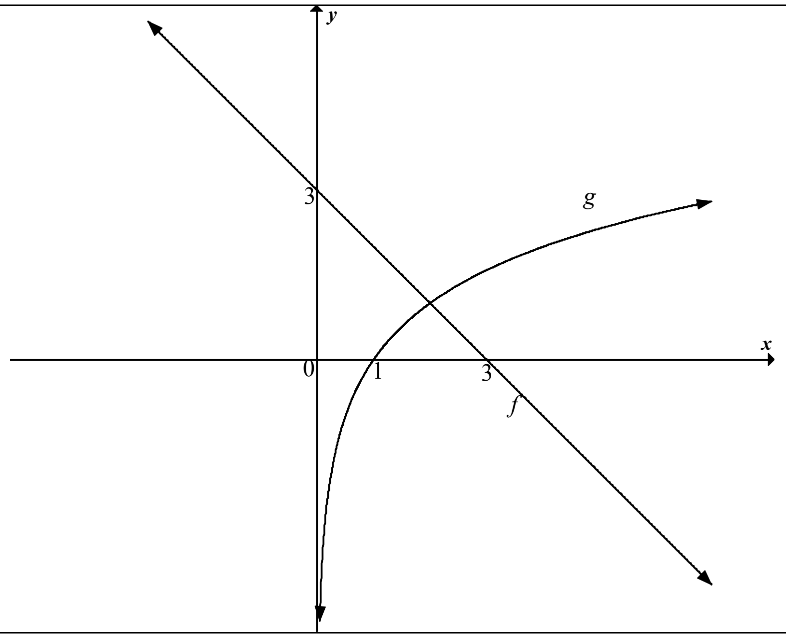
4.1	$y = 0$	✓ $y = 0$ (1)
4.2	R(0 ; 1)	✓ answer (1)
4.3	$y = a^x$ $9 = a^2$ $\therefore a = 3$	✓ substitution ✓ $a = 3$ (2)
4.4	DP $= 2 - b$ $y = 3^x$ $\frac{1}{81} = 3^b$ $3^{-4} = 3^b$ $b = -4$ DP $= 2 - (-4)$ $= 6$ units	✓ $\frac{1}{81} = 3^b$ ✓ 3^{-4} or use of logs ✓ $b = -4$ ✓ DP $= 6$ units (4)
4.5	$h(x+2) + k = 0$ $h(x+2) = -k$ $0 < -k < \frac{1}{81}$ $-\frac{1}{81} < k < 0$	✓✓ $-k < \frac{1}{81}$ or $k > -\frac{1}{81}$ ✓ $-\frac{1}{81} < k < 0$ (3)
		[11]

QUESTION/*VRAAG* 5

5.1	$f(x)=-x^2+4x-3$ $f'(x)=0$ or $x=-\frac{4}{2(-1)}$ $-2x+4=0$ $x=2$ $x=2$ $y=-(2)^2+4(2)-3$ $=1$ $B(2\ ;1)$ **OR/OF** $-x^2+4x-3=0$ $x^2-4x+3=0$ $(x-3)(x-1)=0$ $x=3$ or $x=1$ $x=\frac{3+1}{2}$ $x=2$ $y=-(2)^2+4(2)-3$ $=1$ B(2 ; 1)	✓ $-2x+4=0$ or $x=-\frac{4}{2(-1)}$ ✓ $y=-(2)^2+4(2)-3$ (2) ✓ $x=\frac{3+1}{2}$ ✓ $y=-(2)^2+4(2)-3$ (2)
5.2	Range/*Waardeversameling* : $y\le 1$ **OR/OF** Range/*Waardeversameling* : $y\in(-\infty\ ;1]$	✓ $y\le 1$ (1) ✓ $(-\infty\ ;1]$ (1)
5.3	$x\le -1$ or $x>2$ **OR/OF** $(-\infty\ ;-1]\cup(2\ ;\infty)$	✓ critical values ✓ $x\le -1$ or $x>2$ (2) ✓ critical values ✓ $x\le -1$ or $x>2$ (2)
5.4	$(x-p)(y+t)=3$ Vertical asymptote of h(x) /*vertikale asimptoot* at $x=2$ Translation 4 units to the left / *Translasie 4 eenhede links* $x=2-4=-2$ is the equation of the vertical asymptote of h($x+4$) $x=2-4=-2$ *is die vergelyking van die vertikale asimptoot* **OR/OF**	✓ $x=-2$ (1)

	OR/OF $h(x)=\dfrac{3}{x-2+4}+1$ $=\dfrac{3}{x+2}+1$ $x=-2$ is the equation of the vertical asymptote / *is die vergelyking van die vertikale asimptoot*	✓ $x=-2$ (1)
5.5	$(x-p)(y+t)=3$ $(y+t)=\dfrac{3}{(x-p)}$ $y=\dfrac{3}{x-p}-t$ $\mathrm{B}(2;1)$ Point of intersection of the asymptotes *Snypunt van die asimptote* $p=2$ $-t=1$ $t=-1$	✓ $\dfrac{3}{x-p}$ ✓ $-t$ ✓ $p=2$ ✓ $t=-1$ (4)
5.6	x-intercepts of f / *x-afsnitte van f*: $x^2-4x+3=0$ $(x-3)(x-1)=0$ $x=1$ or $x=3$ $g'(x)<0$ for $x\in R$; $x\neq 2$ Hence $f(x)<0$ $x\leq 1$ or $x\geq 3$ **OR/OF** $(-\infty;1]\cup[3;\infty)$	✓ both critical values ✓ $x\leq 1$ ✓ or ✓ $x\geq 3$ (4) **[14]**

QUESTION/*VRAAG* 6

6.1		g: ✓shape: increasing curve ✓(1 ; 0): only on log graph f: ✓(3 ; 0) ✓(0 ; 3) (4)
6.2	$y = \log_2 x$ $g^{-1}: \ x = \log_2 y$ $y = 2^x$	✓ interchange x and y ✓ $y = 2^x$ (2)
6.3	$\log_2(3-x) = x$ $2^x = 3 - x$ $2^x = -x + 3$ Reflect the graph of g about the line $y = x$ to obtain g^{-1} and determine the point of intersection of f and g^{-1}./ *Reflekteer die grafiek van g om die lyn $y = x$ en bepaal die snypunt van f* and g^{-1}	✓✓ $2^x = -x + 3$ ✓ point of intersection of f and g^{-1} (3)
6.4	$x = 1$	✓ answer (1) **[10]**

QUESTION/*VRAAG* 7

7.1	$A = P(1+i)^n$ $= 250000\left(1+\frac{0,15}{12}\right)^2$ $= R256\ 289,06$	✓substituting i and n values in correct formula ✓ answer (2)
7.2	$P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $256\ 289,06 = \frac{x\left[1-\left(1+\frac{0,15}{12}\right)^{-46}\right]}{\frac{0,15}{12}}$ $3203,6133 = x\left[1-\left(1+\frac{0,15}{12}\right)^{-46}\right]$ $x = R\ 7\ 359,79$ per month **OR/*OF*** $250000 = \frac{x\left(1+\frac{0,15}{12}\right)^{-2}\left[1-\left(1+\frac{0,15}{12}\right)^{-46}\right]}{\frac{0,15}{12}}$ $x = R\ 7\ 359,79$	✓ $i = \frac{0,15}{12}$ ✓ $n = 46$ ✓ substitution into correct formula ✓ answer (4) ✓ $i = \frac{0,15}{12}$ ✓ $n = 46$ ✓ substitution into correct formula ✓ answer (4)
7.3	$256\ 289,06 = \frac{9\ 000\left[1-\left(1+\frac{0,15}{12}\right)^{-n}\right]}{\frac{0,15}{12}}$ $\left(1+\frac{0,15}{12}\right)^{-n} = 0,6440429722$ $-n\log\left(1+\frac{0,15}{12}\right) = \log 0,6440429722$ $n = 35,41872568$ months/ *maande* $\therefore 36$ payments are required $\therefore 36$ *paaiemente moet betaal word* $\therefore$ Thabiso will pay his loan off 10 months sooner./Thabiso *los sy lening 10 maande vroeër af.* **OR/*OF***	✓$x = 9\ 000$ ✓ substitute into correct formula ✓ use of logs ✓ n =35,42 ✓ 10 months (5)

	$256289{,}06\left(1+\frac{0{,}15}{12}\right)^n=\frac{9000\left[\left(1+\frac{0{,}15}{12}\right)^n-1\right]}{\frac{0{,}15}{12}}$ $3203{,}61325\left(1+\frac{0{,}15}{12}\right)^n=9000\left(1+\frac{0{,}15}{12}\right)^n-9000$ $9000=5796{,}38675\left(1+\frac{0{,}15}{12}\right)^n$ $n=\log_{\left(1+\frac{0{,}15}{12}\right)}1{,}5523691425$ $n=35{,}41872568$ $\therefore$ 36 payments are required $\therefore$ 36 *paaiemente moet betaal word* $\therefore$ Thabiso will pay his loan off 10 months sooner./Thabiso *los sy lening 10 maande vroeër af.*	✓ 9 000 ✓ substitute into correct formula ✓ use of logs ✓ n =35,42 ✓ 10 months (5)
7.4	The balance of his loan after the 35th payment was made: *Die balans van sy lening nadat die 35ste paaiement betaal is:* $\text{Balance}=256289{,}06\left(1+\frac{0{,}15}{12}\right)^{35}-\frac{9000\left(\left(1+\frac{0{,}15}{12}\right)^{35}-1\right)}{\frac{0{,}15}{12}}$ $=\text{R }3\,735{,}45$ $\text{Final instalment}=3\,735{,}45\left(1+\frac{0{,}15}{12}\right)$ $=\text{R }3\,782{,}14$ **OR/OF** $\text{P}=\frac{x\left[1-(1+i)^{-n}\right]}{i}$ Final instalment $=\frac{9\,000\left[1-\left(1+\frac{0{,}15}{12}\right)^{-0{,}41872568}\right]}{\frac{0{,}15}{12}}\left(1+\frac{0{,}15}{12}\right)$ $=\text{R }3\,782{,}14$ **OR/OF**	✓ $256289{,}06\left(1+\frac{0{,}15}{12}\right)^{35}$ ✓ $\frac{9000\left(\left(1+\frac{0{,}15}{12}\right)^{35}-1\right)}{\frac{0{,}15}{12}}$ ✓ $3\,735{,}45\left(1+\frac{0{,}15}{12}\right)$ ✓ answer (4) ✓ 0,41872568 ✓ $\frac{9\,000\left[1-\left(1+\frac{0{,}15}{12}\right)^{-0{,}41872568}\right]}{\frac{0{,}15}{12}}$ ✓ $\times\left(1+\frac{0{,}15}{12}\right)$ ✓ answer (4)

	$\text{Balance} = 256289{,}06\left(1+\frac{0{,}15}{12}\right)^{36} - \frac{9000\left(\left(1+\frac{0{,}15}{12}\right)^{36}-1\right)}{\frac{0{,}15}{12}}$ $= \text{R } -5\ 217{,}86$ $\text{Final payment} = 9\ 000 - 5217{,}86$ $= \text{R } 3\ 782{,}14$	✓ $256289{,}06\left(1+\frac{0{,}15}{12}\right)^{36}$ ✓ $\frac{9000\left(\left(1+\frac{0{,}15}{12}\right)^{36}-1\right)}{\frac{0{,}15}{12}}$ ✓ $9\ 000 - 5217{,}86$ ✓ answer (4) **[15]**

QUESTION/*VRAAG* 8

8.1	$f(x+h) = 3(x+h)^2$ $= 3(x^2 + 2xh + h^2)$ $= 3x^2 + 6xh + 3h^2$ $f(x+h) - f(x) = 3x^2 + 6xh + 3h^2 - 3x^2$ $= 6xh + 3h^2$ $f'(x) = \lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $= \lim_{h\to 0}\frac{6xh+3h^2}{h}$ $= \lim_{h\to 0}\frac{h(6x+3h)}{h}$ $= \lim_{h\to 0}(6x+3h)$ $= 6x$ **OR/OF** $f'(x) = \lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $= \lim_{h\to 0}\frac{3(x+h)^2 - 3x^2}{h}$ $= \lim_{h\to 0}\frac{3x^2 + 6xh + 3h^2 - 3x^2}{h}$ $= \lim_{h\to 0}\frac{6xh+3h^2}{h}$ $= \lim_{h\to 0}\frac{h(6x+3h)}{h}$ $= \lim_{h\to 0}(6x+3h)$ $= 6x$	✓ $3(x+h)^2$ ✓ $6xh+3h^2$ ✓ $f'(x) = \lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ ✓ $\lim_{h\to 0}(6x+3h)$ ✓ $6x$ (5) ✓ $f'(x) = \lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ ✓ $3(x+h)^2 - 3x^2$ ✓ $6xh+3h^2$ ✓ $\lim_{h\to 0}(6x+3h)$ ✓ $6x$ (5)

8.2	$\lim_{h\to 0}\frac{\sqrt{4+h}-2}{h}$ $g(x)=\sqrt{x}$ $a=4$	✓ answer ✓ answer (2)
8.3	$y=\sqrt{x^3}-\frac{5}{x^3}$ $y=x^{\frac{3}{2}}-5x^{-3}$ $\frac{dy}{dx}=\frac{3}{2}x^{\frac{1}{2}}+15x^{-4}$	✓ $x^{\frac{3}{2}}$ ✓ $-5x^{-3}$ ✓ $\frac{3}{2}x^{\frac{1}{2}}$ ✓ $15x^{-4}$ (4)
8.4	$f(x)=x^3+ax^2+bx+18$ $f'(x)=3x^2+2ax+b$ At $x=1$, $m_{\tan}=-8$ $f'(1)=-8$ $3(1)^2+2a(1)+b=-8$ $3+2a+b=-8$ $2a+b=-11$ ....(1) $y=f(1)$ $=g(1)$ $=-8(1)+20$ $=12$ $1+a+b+18=12$ $a+b=-7$ ....(2) $a=-4$ $b=-3$	✓ $3x^2+2ax+b$ ✓ $f'(1)=-8$ or $3(1)^2+2a(1)+b=-8$ ✓ $1+a+b+18=12$ ✓ $a=-4$ ✓ $b=-3$ (5) **[16]**

QUESTION/*VRAAG* 9

9.1	$f'(x)=3x^2+8x-3=0$ $(3x-1)(x+3)=0$ $x=\frac{1}{3} \quad or \quad x=-3$	✓ equating derivative to zero ✓ factors ✓ x – values (3)
9.2	$f''(x)=6x+8$ $6x+8<0$ $x<-\frac{4}{3}$ **OR** $x=\frac{\frac{1}{3}-3}{2}$ $=\frac{4}{3}$ $\therefore x<-\frac{4}{3}$	✓ $6x+8$ ✓✓ $x<-\frac{4}{3}$ (3) ✓ $\frac{\frac{1}{3}-3}{2}$ ✓✓ $x<-\frac{4}{3}$ (3)
9.3	$x\le -3$ or $x\ge \frac{1}{3}$ **OR/OF** $[-\infty;-3]\ \cup \left[\frac{1}{3};\infty\right]$	✓ $x\le -3$ ✓ $x\ge \frac{1}{3}$ (2) ✓ $[-\infty;-3]$ ✓ $\left[\frac{1}{3};\infty\right]$ (2)
9.4	$f(0)=-18$ $d=-18$ $f(x)=ax^3+bx^2+cx-18$ $f'(x)=3ax^2+2bx+c$ $f'(x)=3x^2+8x-3$ $3a=3 \quad 2b=8$ $a=1 \quad b=4 \quad c=-3$ $f(x)=x^3+4x^2-3x-18$ **OR/OF** $f'(x)=3x^2+8x-3$ By integration/*Deur integrasie* $f(x)=x^3+4x^2-3x+d$ $f(0)=d=-18$ $a=1$ $b=4$ $c=-3$	✓ $d=-18$ ✓ $f'(x)=3ax^2+2bx+c$ ✓ $a=1$ ✓ $b=4$ ✓ $c=-3$ (5) ✓ $f(x)=x^3+4x^2-3x+d$ ✓ $d=-18$ ✓ $a=1$ ✓ $b=4$ ✓ $c=-3$ (5)
		[13]

QUESTION/*VRAAG* 10

10.1	$M(t) = -t^3 + 3t^2 + 72t$ $M(3) = -(3)^3 + 3(3)^2 + 72(3)$ $= 216$ 216 molecules/*molekules*	✓ $M(3) = -(3)^3 + 3(3)^2 + 72(3)$ ✓ 216 (2)
10.2	$M(t) = -t^3 + 3t^2 + 72t$ $M^{/}(t) = -3t^2 + 6t + 72$ $M^{/}(2) = -3(2)^2 + 6(2) + 72$ $= 72$ 72 molecules per hour/*molekules per uur*	✓ $M^{/}(t) = -3t^2 + 6t + 72$ ✓ $M^{/}(2)$ ✓ 72 (3)

10.3	$M(t) = -t^3 + 3t^2 + 72t$
	$M^{/}(t) = -3t^2 + 6t + 72$
	$M^{//}(t) = 0$
	$-6t + 6 = 0$
	$t = 1$
	Maximum rate of change of the number of molecules of the drug in the bloodstream is after 1 hour./*Maksimum tempo van verandering van die getal molekules in die bloedstroom is na 1 uur*
		✓ $M^{//}(t)$
		✓ $M^{//}(t) = 0$
		
		✓ answer
		
		(3)
		[8]

QUESTION/*VRAAG* 11

11.1	<table><tr><td></td><td>Watches TV during exams</td><td>Do not watch TV during exams</td><td>Total</td></tr><tr><td>Male</td><td>80</td><td>a</td><td>80+a</td></tr><tr><td>Female</td><td>48</td><td>12</td><td>60</td></tr><tr><td>Total</td><td>b</td><td>32</td><td>160</td></tr></table> $a+12=32$ $a=20$ $b=80+48$ $=128$	✓$a=20$ ✓$b=128$ (2)
11.2	No $P(\text{M and not watching TV})=\dfrac{20}{160}\neq 0$	✓No ✓reason (2)
11.3.1	$\text{P}(\text{watching TV})=\dfrac{128}{160}=\dfrac{4}{5}=0{,}8=80\%$	✓128 ✓160 (2)
11.3.2	$\text{P}(\text{female and not watching TV})=\dfrac{12}{160}=\dfrac{3}{40}=0{,}075=7{,}5\%$	✓ 12 ✓160 (2) **[8]**

QUESTION/*VRAAG* 12

12.	We want to create codes that are even numbers greater than 5000. The digit 6 can be used in one of two places in these codes and therefore this presents two scenarios. *Ons wil kodes kry wat ewe getalle groter as* 5000 *is. Die syfer* 6 *kan in twee posisies in die kode gebruik word en twee opsies is moontlik:* CASE 1: The first digit is a 6./*Die eerste syfer is'n* 6. **6** / **2, 4** $\underline{1} \times \underline{5} \times \underline{4} \times \underline{2}$ Number of codes starting with 6./*Getal kodes wat met* 6 *begin.* $= 1 \times 5 \times 4 \times 2 = 40$ CASE 2: The first digit is a 5 or 7./*Die eerste syfer is'n* 5 *of* 7. **5, 7** / **2, 4, 6** $\underline{2} \times \underline{5} \times \underline{4} \times \underline{3}$ Number of codes not starting with 6./*Getal kodes wat nie met* 6 *begin* $= 2 \times 5 \times 4 \times 3 = 120$ Therefore total number of possible codes./*Die totale getal moontlike kodes* $= 40 + 120 = 160$.	✓ $1 \times 5 \times 4 \times 2$ ✓ 40 ✓ $2 \times 5 \times 4 \times 3$ ✓ 120 ✓ 160 **[5]**
	OR/OF $(3\times5\times4\times1) + (3\times5\times4\times1) + (2\times5\times4\times1)$ $= 60 + 60 + 40$ $= 160$	✓ $(3\times5\times4\times1)$ ✓ $(3\times5\times4\times1)$ ✓ $(2\times5\times4\times1)$ ✓✓ 160 **[5]**
	OR/OF $(3\times5\times4\times3) - (1\times5\times4\times1)$ $= 180 - 20$ $= 160$	✓✓ $(3\times5\times4\times3)$ ✓✓ $(1\times5\times4\times1)$ ✓ 160 **[5]**

TOTAL/*TOTAAL*: 150