**NATIONAL
SENIOR CERTIFICATE**

GRADE/*GRAAD* 12

MATHEMATICS P1/*WISKUNDE V1*

NOVEMBER 2014

MEMORANDUM

MARKS: 150
PUNTE: 150

This memorandum consists of 22 pages.
Hierdie memorandum bestaan uit 22 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, merk slegs die EERSTE poging.*
- *Volgehoue akkuraatheid is DEURGAANS op ALLE aspekte van die memorandum van toepassing.*

QUESTION/*VRAAG* 1

1.1.1	$(x-2)(4+x)=0$ $x=2$ or $x=-4$	✓ $x=2$ ✓ $x=-4$ (2)
1.1.2	$3x^2 - 2x - 14 = 0$ $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \dfrac{2 \pm \sqrt{(-2)^2 - 4(3)(-14)}}{2(3)}$ $= \dfrac{2 \pm \sqrt{172}}{6}$ $x = 2{,}52$ or/*of* $x = -1{,}85$	✓ standard form/*standaardvorm* ✓ substitution into correct formula/ *substitusie in korrekte formule* ✓✓ answers/ *antwoorde* (4)
	OR/*OF* $x^2 - \dfrac{2}{3}x + \dfrac{1}{9} = \dfrac{14}{3} + \dfrac{1}{9}$ $\left(x - \dfrac{1}{3}\right)^2 = \dfrac{43}{9}$ $x - \dfrac{1}{3} = \pm \dfrac{\sqrt{43}}{3}$ $\therefore x = \dfrac{1 \pm \sqrt{43}}{3}$ $x = 2{,}52$ or/*of* $x = -1{,}85$	✓for adding $\dfrac{1}{9}$ on both sides/*tel* $\dfrac{1}{9}$ *by aan beide kante* ✓ $x = \dfrac{1 \pm \sqrt{43}}{3}$ ✓✓answers (4)

| 1.1.3 | $2^{x+2} + 2^x = 20$
 $2^x(2^2 + 1) = 20$
 $2^x = \dfrac{20}{5}$
 $2^x = 2^2$
 $\therefore x = 2$

 OR/*OF*

 $2^x.2^2 + 2^x = 2^2.5$
 $2^x(2^2 + 1) = 2^2.5$
 $2^x.5 = 2^2.5$
 $\therefore x = 2$
 OR/*OF*

 $4.2^x + 2^x = 20$
 $5.2^x = 20$
 $2^x = 4 = 2^2$
 $\therefore x = 2$ | ✓common factor/*gemeen. faktor*
 ✓ simplification/ *vereenvoudiging*

 ✓ answer/*antwoord*
 (3)

 ✓ common factor/*gemeen. faktor*
 ✓ simplification/ *vereenvoudiging*
 ✓ answer/*antwoord*
 (3)

 ✓ $5.2^x = 20$
 ✓ $2^x = 4$
 ✓answer/*antwoord*
 (3) |
| 1.2 | $x = 2y + 3$ ....(1)
 $3x^2 - 5xy = 24 + 16y$ ....(2)

 (1) in (2):
 $3(2y+3)^2 - 5(2y+3)y = 24 + 16y$
 $3(4y^2 + 12y + 9) - 10y^2 - 15y = 24 + 16y$
 $12y^2 + 36y + 27 - 10y^2 - 15y - 24 - 16y = 0$
 $2y^2 + 5y + 3 = 0$
 $(2y+3)(y+1) = 0$
 $y = -\dfrac{3}{2}$ or $y = -1$
 $\therefore x = 2\left(-\dfrac{3}{2}\right) + 3$ or $x = 2(-1) + 3$
 $x = 0$ or $x = 1$
 $(0\,;\,-\dfrac{3}{2})$ $(1\,;\,-1)$

 OR/*OF* | ✓ substitution/*substitusie*

 ✓ simplification/ *vereenvoudiging*
 ✓standard form/ *standaardvorm*
 ✓factorisation/*faktorisering*
 ✓*y*-values/*y-waardes*

 ✓*x*-values/*x-waardes*
 (6) |

	$y = \dfrac{x-3}{2}$ $3x^2 - 5x\left(\dfrac{x-3}{2}\right) = 24 + 16\left(\dfrac{x-3}{2}\right)$ $3x^2 - \dfrac{5x^2 - 15x}{2} = 24 + \dfrac{16x - 48}{2}$ $\times 2 : 6x^2 - 5x^2 + 15x = 48 + 16x - 48$ $x^2 - x = 0$ $x(x-1) = 0$ $x = 0 \;\; or \;\; x = 1$ $y = -\dfrac{3}{2} \; or \; y = -1$	✓substitution/*substitusie* ✓simplification/ *vereenvoudiging* ✓standard form / *standard vorm* ✓ factors/*faktore* ✓*x*- values/*x*- *waardes* ✓ *y*-values/*y*-waardes	(6)
1.3	$(x-1)(x-2) < 6$ $x^2 - 3x + 2 < 6$ $x^2 - 3x - 4 < 0$ $(x+1)(x-4) < 0$ $-1 < x < 4 \quad or \quad x \in (-1; 4)$	✓ standard form/ *standaardvorm* ✓factorisation/*faktorisering* ✓critical values in the context of inequality / *kritiese waardes in die konteks van die ongelykheid* ✓notation/*notasie*	(4)
1.4	$-k - 4 \geq 0$ $k \leq -4$	✓ $-k - 4 \geq 0$ ✓ answer/*antwoord*	(2) **[21]**
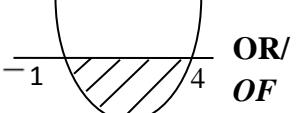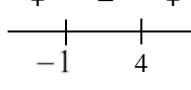
QUESTION/*VRAAG* 2

2.1	$T_4 = 23$	✓23 (1)
2.2	$T_{251} = a + (n-1)d$ $= 2 + (251-1)(7)$ $= 1752$	✓$a = 2$ and $d = 7$ ✓subst. into correct formula /*subt. in korrekte formule* ✓1752 (3)
2.3	$\displaystyle\sum_{n=1}^{251}(7n-5)$ **OR/*OF*** $\displaystyle\sum_{p=0}^{250}(7p+2)$	✓ general term/ *algemene term* ✓ complete answer /*volledige antwoord* (2) ✓ general term/ *algemene term* ✓ complete answer / *volledige antwoord* (2)
2.4	$S_n = \dfrac{n}{2}[a+l]$ $S_n = \dfrac{251}{2}[2+1752]$ $\quad = 220127$ **OR/*OF*** $S_n = \dfrac{n}{2}[2a+(n-1)d]$ $\quad = \dfrac{251}{2}[2(2)+(251-1)(7)]$ $\quad = 220127$	✓substitution/*substitusie* ✓220127 (2) ✓substitution/*substitusie* ✓220127 (2)
2.5	The new series/*Die nuwe reeks* is 16 + 44 + 72 + …+1 752 $16 + 28(n-1) = 1752$ $1736 = 28(n-1)$ $62 = n-1$ $n = 63$ **OR/*OF*** $2 + 9 + \underline{16} + 23 + 30 + 37 + \underline{44} + 51 + ... + \underline{1752}$ T_3 is divisible by /is deelbaar deur 4 Then $T_7, T_{11}, T_{15}, ..., T_{251}$ are divisible by 4, thus each 4th term is divisible by 4. Daarna is $T_7, T_{11}, T_{15}, ..., T_{251}$ deelbaar deur 4, d.w.s. elke 4de term is deelbaar deur 4. $\therefore$ number of terms divisible by 4 will be $= \dfrac{251-3}{4} + 1 = 63$ $\therefore$ aantal terme deelbaar deur 4 sal wees $= \dfrac{251-3}{4} + 1 = 63$ **OR/*OF***	✓✓generating new series divisible by 4/ *vorming van nuwe reeks deelbaar deur 4* ✓ $T_n = 1752$ ✓ 63 (4) ✓ T_3 is divisible by 4/ *is deelbaar deur 4* ✓identifying terms divisible by 4/ *identifiseer terme deelbaar deur 4* ✓ reasoning/*redenering* ✓63 (4)

| Position of terms divisible by 4:
$3 ; 7 ; 11 ; \ldots; 247; 251$
$T_n = 4n - 1 = 251$
$4n = 252$
$n = 63$ | $\checkmark\checkmark$ generating sequence involving position of terms/*vorming van reeks i.t.v. posisie van terme*
$\checkmark T_n = 251$
$\checkmark 63$ (4)

[12] |

QUESTION/*VRAAG* 3

3.1.1	-1 ; -7 ; -11 ; p ; ...	
	-6 -4 $p+11$	
	2 2	
	$p + 11 - (-4) = 2$	
	$p + 15 = 2$	✓$p + 15 = 2$
	$p = -13$	✓$p = -13$ (2)
	OR/*OF*	
	-1 ; -7 ; -11 ; p ; ...	
	-6 -4 $p+11$	✓first differences/ *eerste verskille*
	2 2	
	$p + 11 = -2$	
	$p = -13$	✓$p = -13$ (2)
3.1.2	$2a = 2$	
	$a = 1$	✓$a = 1$
	$3a + b = -6$	
	$3(1) + b = -6$	
	$b = -9$	✓$b = -9$
	$a + b + c = -1$	
	$1 - 9 + c = -1$	
	$c = 7$	✓$c = 7$
	$T_n = n^2 - 9n + 7$	✓answer/*antwoord* (4)
	OR/*OF*	
	$T_n = T_1 + (n-1)d_1 + \dfrac{(n-1)(n-2)d_2}{2}$	✓formula/*formule*
	$= -1 + (n-1)(-6) + \dfrac{(n-1)(n-2)(2)}{2}$	✓substitution of first and second differences/*substitusie van eerste en tweede verskille*
	$= -1 - 6n + 6 + \dfrac{2n^2 - 6n + 4}{2}$	✓simplification/*vereenvoudiging*
	$= n^2 - 9n + 7$	✓answer/*antwoord* (4)

OR/*OF*

$7 ; -1 ; -7 ; -11 ; p ; ...$

$-8 \qquad -6 \qquad -4 \qquad p + 11$

$2 \qquad 2 \qquad 2$

✓ *c*-value/*c-waarde*
✓ *a*-value/*a-waarde*
✓ *b*-value/*b-waarde*

$T_0 = 7 = c$

$2a = 2 \quad \therefore a = 1$

$3a + b = -6 \quad \therefore b = -9$

$T_n = n^2 - 9n + 7$

✓ answer/*antwoord*

(4)

OR/OF

✓ *a*-value/*a-waarde*

$a = \dfrac{1}{2}(2) = 1$

$\therefore T_n = n^2 + bn + c$

$T_1 = -1 \quad \therefore 1 + b + c = -1 \quad ....(1)$

$T_2 = -7 \quad \therefore 4 + 2b + c = -7 ....(2)$

$(2) - (1) : \quad 3 + b = -6$

$\therefore b = -9$

$\text{sub in } (1) : c = 7$

$\therefore T_n = n^2 - 9n + 7$

✓ *b*-value/*b-waarde*
✓ *c*-value/*c-waarde*

✓ answer/*antwoord*

(4)

		(4)
3.1.3	The sequence of first differences is/*Die reeks van eerste verskille is*: $-6\,;\,-4\,;\,-2\,;\,0\,;\,...$ $-6+(n-1)(2)=96$ 　　　　$n=52$ $\therefore$ two terms are/*twee terme is*: $T_{52}=52^2-9(52)+7=2243$ $T_{53}=53^2-9(53)+7=2339$ **OR/OF** The sequence of first differences is/*Die reeks van eerste verskille is*: $-6\,;\,-4\,;\,-2\,;\,0\,;\,...$ The formula for the sequence of first differences/*Die formule vir die reeks van eerste verskille* is $T_n=2n-8$ 1$^{\text{st}}$ difference/*1$^{\text{ste}}$ verskil*:　　$2n-8=96$ 　　　　　　　　$2n=104$ 　　　　　　　　$n=52$ $\therefore$ two terms are/*twee terme is*: $T_{52}=52^2-9(52)+7=2243$ $T_{53}=53^2-9(53)+7=2339$ **OR/*OF*** 　　　　　　$T_n-T_{n-1}=96$ $\left(n^2-9n+7\right)-\left[(n-1)^2-9(n-1)+7\right]=96$ $n^2-9n+7-n^2+2n-1+9n-9-7=96$ 　　　　　　$2n=106$ 　　　　　　$n=53$ 　　　　$T_{52}=52^2-9(52)+7=2243$ 　　　　$T_{53}=53^2-9(53)+7=2339$	$\checkmark\,-6+(n-1)(2)=96$ $\checkmark\,52$ $\checkmark\,2\,243$ $\checkmark\,2\,339$　　　　(4) $\checkmark\,2n-8=96$ $\checkmark\,52$ $\checkmark\,2\,243$ $\checkmark\,2\,339$　　(4) $\checkmark\,T_n-T_{n-1}=96$ $\checkmark\,53$ $\checkmark\,2\,243$ $\checkmark\,2\,339$　　(4)	
	OR/OF 　　　　　　$T_{n+1}-T_n=96$ $\left[(n+1)^2-9(n+1)+7\right]-\left[n^2-9n+7\right]=96$ $n^2+2n+1-9n-9+7-n^2+9n-7=96$ 　　　　　　$2n=104$ 　　　　　　$n=52$ 　　　　$T_{52}=52^2-9(52)+7=2243$ 　　　　$T_{53}=53^2-9(53)+7=2339$	$\checkmark\,T_{n+1}-T_n=96$ $\checkmark\,52$ $\checkmark\,2\,243$ $\checkmark\,2\,339$ 　　　(4)	

3.2.1	$T_{12} = 16\left(\dfrac{1}{4}\right)^{12-1}$ $= \dfrac{1}{4^9}$ or 4^{-9} or $\dfrac{1}{2^{18}}$ or 2^{-18}	✓ $a = 16$ and $r = \dfrac{1}{4}$ ✓subst. into correct formula/ *subt in korrekte formule* ✓ answer/*antwoord* (3)
3.2.2	$S_{10} = \dfrac{16\left(1 - \left(\dfrac{1}{4}\right)^{10}\right)}{1 - \dfrac{1}{4}}$ $= 21{,}33$ **OR/OF** $S_{10} = \dfrac{16\left(\left(\dfrac{1}{4}\right)^{10} - 1\right)}{\dfrac{1}{4} - 1}$ $= 21{,}33$	✓ substitution into correct formula /*substitusie in korrekte formule* ✓ answer/*antwoord* (2) ✓ substitution into correct formula /*substitusie in korrekte formule* ✓ answer/*antwoord* (2)
3.3	$\left(1+\dfrac{1}{2}\right)\left(1+\dfrac{1}{3}\right)\left(1+\dfrac{1}{4}\right)\ldots\left(1+\dfrac{1}{99}\right)$ $= \left(\dfrac{\cancel{3}}{2}\right)\left(\dfrac{\cancel{4}}{\cancel{3}}\right)\left(\dfrac{\cancel{5}}{\cancel{4}}\right)\left(\dfrac{\cancel{6}}{\cancel{5}}\right)\ldots\left(\dfrac{100}{\cancel{99}}\right)$ $= \left(\dfrac{100}{2}\right)$ $= 50$ **OR/OF** $\left(1+\dfrac{1}{2}\right)\left(1+\dfrac{1}{3}\right)\left(1+\dfrac{1}{4}\right)\ldots\left(1+\dfrac{1}{99}\right)$ $T_1 = \left(1+\dfrac{1}{2}\right) = \dfrac{3}{2}$ $T_2 = \dfrac{3}{2}\left(1+\dfrac{1}{3}\right) = \dfrac{3}{2} \times \dfrac{4}{3} = 2$ $T_3 = 2\left(1+\dfrac{1}{4}\right) = 2 \times \dfrac{5}{4} = \dfrac{5}{2}$ $\dfrac{3}{2}, 2, \dfrac{5}{2} \ldots$ is an arithmetic sequence with $a = \dfrac{3}{2}$ and $d = \dfrac{1}{2}$ $\therefore T_{98} = \dfrac{3}{2} + (98-1)\dfrac{1}{2}$ $= \dfrac{100}{2} = 50$	✓ improper fractions/ *onegte breuke* ✓ $\left(1+\dfrac{1}{99}\right)$ or $\left(\dfrac{100}{99}\right)$ ✓✓ answer/*antwoord* (4) ✓ $\left(1+\dfrac{1}{99}\right)$ ✓ giving the first three terms / *gee die eerste drie terme* ✓✓answer /*antwoord* (4) **[19]**

QUESTION/*VRAAG* 4

4.1	$p = 1$ $q = 1$	✓ p value /*waarde* ✓ q value /*waarde* (2)

4.2	$0 = \dfrac{2}{x+1} + 1$
	
	 $-x - 1 = 2$
	
	 $x = -3$
	
	 OR/*OF*
	
	 Reflect (0 ; 3) across $y = -x$ to get T(-3 ; 0)
	 $x = -3$
	 Reflekteer (0 ; 3) *om* $y = -1$ *om* T(-3 ; 0) *te kry*
	 $x = -3$
		✓ $0 = \dfrac{2}{x+1} + 1$
		
		 ✓ $x = -3$
		            (2)
		
		 ✓ reflect across/*reflekteer om* $y = -x$
		
		 ✓ $x = -3$
		            (2)

4.3	Shifting g five units to the left shifts (-1 ; 0) five units to the left. $x = -6$	✓ answer/*antwoord* (1)
4.4	$\dfrac{2}{x+1} + 1 = x$ $2 + x + 1 = x^2 + x$ $x^2 = 3$ $\therefore x = \sqrt{3}$ since at S, $x > 0$ $y = \sqrt{3} = 1{,}73...$ $\text{OS}^2 = x^2 + y^2 = 3 + 3 = 6$ $\therefore \text{OS} = \sqrt{6} = 2{,}45$ units/*eenhede* **OR**/*OF*	✓ equating both graphs/*stel grafieke gelyk* ✓ $x^2 = 3$ ✓ $x = \sqrt{3}$ and $y = \sqrt{3}$ ✓ OS$^2 = 6$ ✓ answer/*antwoord* (5)

| | Translate *g* one unit down and one unit to the right/*Transleer g een eenheid af en een eenheid na regs*

The new equation/*Die nuwe vergelyking* : $p(x) = \dfrac{2}{x}$

Therefore the image of S is $S^{/}\left(\sqrt{2};\sqrt{2}\right)$/
Daarom is die beeld van S nou $S^{/}\left(\sqrt{2};\sqrt{2}\right)$
Now translate *p* back to *g*/*Transleer p terug na g*: $S\left(\sqrt{2}-1;\sqrt{2}+1\right)$

$OS^{2} = \left(\sqrt{2}-1\right)^{2} + \left(\sqrt{2}+1\right)^{2} = 2 - 2\sqrt{2} + 1 + 2 + 2\sqrt{2} + 1$

$\therefore OS = \sqrt{6} = 2,45$ units/*eenhede* | ✓ $p(x) = \dfrac{2}{x}$

✓✓coord. of/*koörd. van* $S^{/}$

✓coord. of/*koörd. van* S

✓answer/*antwoord*   (5) |
| 4.5 | $k < 3$ will give roots with opposite signs/
$k < 3$ sal wortels met teenoorgestelde tekens gee | ✓$k < 3$ (1)

[11] |

QUESTION 5

5.1	$y = \log_a x$ $-1 = \log_a \frac{1}{3}$ $a^{-1} = \frac{1}{3}$ $a = \left(\frac{1}{3}\right)^{-1}$ $\therefore a = 3$	✓ subt. $\left(\frac{1}{3} ; -1\right)$ ✓ $a^{-1} = \frac{1}{3}$ or $a = \left(\frac{1}{3}\right)^{-1}$ (2)
5.2	$h: \quad x = \log_3 y$ $\therefore \quad y = 3^x$	✓ swop *x* and *y*/*ruil x en y* ✓ answer/*antwoord* (2)
5.3	$g(x) = -\log_3 x$ **OR/*OF*** $g(x) = \log_3 \frac{1}{x}$ **OR/*OF*** $g(x) = \log_{\frac{1}{3}} x$ **OR/OF** $x = 3^{-y}$ **OR/OF** $x = \left(\frac{1}{3}\right)^y$	✓ answer/*antwoord* (1) ✓ answer/*antwoord* (1) ✓ answer/*antwoord* (1) ✓ answer/*antwoord* (1) ✓ answer/*antwoord* (1)
5.4	$x > 0$ **OR/*OF*** $(0 ; \infty)$	✓ answer/*antwoord* (1) ✓ answer/*antwoord* (1)
5.5	$\log_3 x = -3$ $x = 3^{-3}$ $x = \frac{1}{27}$ $x \geq \frac{1}{27}$	✓ exponential form/ *eksponensiële vorm* ✓ simplification/*vereenvoudiging* ✓ answer/*antwoord* (3) **[9]**

QUESTION/*VRAAG* 6

6.1	$4x^2 - 6 = 0$ $x^2 = \dfrac{3}{2}$ $x = 1{,}22$ (*x* - coordinate of S is positive)	✓ $y = 0$ ✓ $1{,}22$ (2)
6.2	(0 ; – 6)	✓ 0 ✓ – 6 (2)
6.3.1	$QT = f(x) - g(x)$ $= 2\sqrt{x} - (4x^2 - 6)$ or $= 2\sqrt{x} - 4x^2 + 6$	✓✓ correct formula/ *korrekte formule* ✓ substitution/*substitusie* (3)
6.3.2	$QT = 2x^{\frac{1}{2}} - 4x^2 + 6$ Deravitive of $QT = x^{\frac{-1}{2}} - 8x = 0$ $\dfrac{1}{\sqrt{x}} = 8x$ $x^{\frac{3}{2}} = \dfrac{1}{8}$ or $\dfrac{1}{x} = 64x^2$ $x = \left(\dfrac{1}{8}\right)^{\frac{2}{3}}$ $x = \left(\dfrac{1}{2}\right)^2$ or $x^3 = \dfrac{1}{64}$ $x = \dfrac{1}{4} = 0{,}25$ Max/*Maks* $QT = 2\left(\dfrac{1}{4}\right)^{\frac{1}{2}} - 4\left(\dfrac{1}{4}\right)^2 + 6$ $= 6\dfrac{3}{4} = 6{,}75$ units/*eenhede*	✓ derivative/*afgeleide* ✓ derivative equal to 0/ *afgeleide gelyk aan 0* ✓ $x^{\frac{3}{2}} = \dfrac{1}{8}$ ✓ *x*-value/*x-waarde* ✓ substitution/*substitusie* ✓ answer/*antwoord* (6) **[13]**

QUESTION/*VRAAG* 7

| 7.1 | $A = P(1-i)^n$ | |
	$72\,500 = 145\,000\,(1-i)^5$	✓ substitution/*substitusie*
	$i = 1 - \sqrt[5]{\dfrac{72500}{145000}}$	✓ writing in terms of i *herskryf in terme van i*
	$= 0{,}1294...$	✓ answer/*antwoord* (3)
	∴ Rate of interest/*Rentekoers* is 12,94 % p.a./*p.j.*	
	OR/*OF*	
	$(1-i)^5 = \dfrac{1}{2}$	✓ substitution/*substitusie*
	∴ $i = 1 - \left(\dfrac{1}{2}\right)^{\frac{1}{5}}$	✓ writing i.t.o i
	$i = 0{,}1294$	
	∴ Rate of interest/*Rentekoers* is 12,94 % p.a./*p.j.*	✓ answer (3)
7.2.1	$P = \dfrac{x\left[1-(1+i)^{-n}\right]}{i}$	✓ $i = \dfrac{0{,}12}{12}$
	$500\,000 = \dfrac{x\left[1-\left(1+\dfrac{0{,}12}{12}\right)^{-240}\right]}{\dfrac{0{,}12}{12}}$	✓ $n = 240$ ✓ substitution into correct formula
	$x = \dfrac{500000 \times \dfrac{0{,}12}{12}}{\left[1-\left(1+\dfrac{0{,}12}{12}\right)^{-240}\right]}$	
	$x = \text{R}5505{,}43$	✓ answer/*antwoord* (4)

7.2.2	$$P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$$ $$500000 = \frac{6000\left[1-\left(1+\frac{0,12}{12}\right)^{-n}\right]}{\frac{0,12}{12}}$$ $$\frac{500000}{6000} \times 0,01 = 1-(1,01)^{-n}$$ $$(1,01)^{-n} = 1-\frac{5}{6}$$ $$-n = \frac{\log\frac{1}{6}}{\log 1,01}$$ $$n = 180,07$$ $\therefore$ Melissa settles the loan in 181 months	✓6000 ✓substitute into correct formula/*substitusie in korrekte formule* ✓ use of logs/*gebruik van logs* ✓answer/*antwoord* (4)
7.2.3	Samuel He is paying off his loan over a longer period thus more interest will be paid./*Hy betaal sy lening oor 'n langer tydperk af, dus sal hy meer rente betaal.* **OR/*OF*** Samuel He will pay/*Hy betaal* R5505,43 × 240 – R500 000 = R821 303,20 She will pay between/*Sy sal tussen* R580 000 and/*en* R586 000,00 *betaal.*	✓Samuel ✓reason/*rede* (2) ✓Samuel ✓reason/*rede* (2) **[13]**

QUESTION/*VRAAG* 8

8.1	$f(x+h) = (x+h)^3 = (x^2 + 2xh + h^2)(x+h)$
	$\qquad\qquad\quad = x^3 + x^2h + 2x^2h + 2xh^2 + h^2x + h^3$
	$\qquad\qquad\quad = x^3 + 3x^2h + 3xh^2 + h^3$
	$f(x+h) - f(x) = x^3 + 3x^2h + 3xh^2 + h^3 - x^3$
	$\qquad\qquad\qquad = 3x^2h + 3xh^2 + h^3$ $\qquad$ ✓simplifying/*vereenvouding*
	$f'(x) = \lim_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$ $\qquad$ ✓formula/*formule*
	$\qquad = \lim_{h \to 0} \dfrac{3x^2h + 3xh^2 + h^3}{h}$ $\qquad$ ✓subst. into formula/*subst. in formule*
	$\qquad = \lim_{h \to 0} \dfrac{h(3x^2 + 3xh + h^2)}{h}$ $\qquad$ ✓factorization/*faktorisering*
	$\qquad = \lim_{h \to 0} (3x^2 + 3xh + h^2)$
	$\qquad = 3x^2$ $\qquad$ ✓answer/*antwoord*
	$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ (5)
	OR/OF
	$f'(x) = \lim_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$ $\qquad$ ✓formula/*formule*
	$\qquad = \lim_{h \to 0} \dfrac{(x+h)^3 - x^3}{h}$ $\qquad$ ✓subst. into formula/*subst. in formule*
	$\qquad = \lim_{h \to 0} \dfrac{(x+h)(x+h)^2 - x^3}{h}$
	$\qquad = \lim_{h \to 0} \dfrac{(x+h)(x^2 + 2xh + h^2) - x^3}{h}$
	$\qquad = \lim_{h \to 0} \dfrac{x^3 + 3x^2h + 3xh^2 + h^3 - x^3}{h}$ $\qquad$ ✓simplifying/*vereenvoudiging*
	$\qquad = \lim_{h \to 0} \dfrac{h(3x^2 + 3xh + h^2)}{h}$ $\qquad$ ✓factorization/*faktorisering*
	$\qquad = \lim_{h \to 0} (3x^2 + 3xh + h^2)$
	$\qquad = 3x^2$ $\qquad$ ✓answer/*antwoord*
	OR $\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ (5)

	$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$ $$= \lim_{h \to 0} \frac{(x+h)^3 - x^3}{h}$$ $$= \lim_{h \to 0} \frac{(x+h-x)(x^2 + 2xh + h^2 + x^2 + xh + x^2)}{h}$$ $$= \lim_{h \to 0} \frac{h(3x^2 + 3xh + h^2)}{h}$$ $$= \lim_{h \to 0}(3x^2 + 3xh + h^2)$$ $$= 3x^2$$	✓formula/*formule* ✓subst. into formula/*subst. in formule* ✓factorization/*faktorisering* ✓simplifying/*vereenvoudiging* ✓answer/*antwoord* (5)

8.2	$f'(x) = 4x + 2x^3$	✓$4x$ ✓$2x^3$ (2)
8.3	$$y = x^{12} - 2x^6 + 1$$ $$\frac{dy}{dx} = 12x^{11} - 12x^5$$ $$= 12x^5(x^6 - 1)$$ $$= 12x^5\sqrt{y}$$	✓simplification/*vereenvoudiging* ✓derivative/*afgeleide* ✓factors/*faktore* (3)
8.4	$$f(x) = 2x^3 - 2x^2 + 4x - 1$$ $$f'(x) = 6x^2 - 4x + 4$$ $$f''(x) = 12x - 4$$ f is concave up when/*is konkaaf op as* $f''(x) > 0$ $$\therefore 12x - 4 > 0$$ $$12x > 4$$ $$x > \frac{1}{3}$$	✓first derivative/*eerste afgeleide* ✓ second derivative/*tweede afgeleide* ✓ $f''(x) > 0$ ✓ $x > \frac{1}{3}$ (4) **[14]**

QUESTION/*VRAAG* 9

9.1	$f^{/}(x) = 3x^2 - 8x - 3 = 0$	✓derivative/*afgeleide* ✓derivative/ *afgeleide* $= 0$ ✓factors/*faktore*
	$(3x + 1)(x - 3) = 0$	
	$x = -\dfrac{1}{3}$ or $x = 3$	✓x-values/*waardes*
	$y = \dfrac{500}{27}$ $\left(\text{or} \quad y = 18\dfrac{14}{27} \text{ or } 18{,}52\right)$ $y = 0$	✓✓each y- values/*elke y-waarde*
	Turning points are/*Draaipunte is* $\left(-\dfrac{1}{3};\dfrac{500}{27}\right)$ and $(3;0)$	(6)
9.2		✓x-intercepts/*afsnitte* ✓y-intercept/*afsnit* ✓turning points/ *draaipunte* ✓shape/*vorm*
		(4)
9.3	$x < \dfrac{-1}{3}$ or $0 < x < 3$ **OR** $(-\infty;-\dfrac{1}{3}) \cup (0;3)$	✓ $x < \dfrac{-1}{3}$ ✓both critical points/ *beide kritieke-punte* ✓notation/*notasie*
		(3)
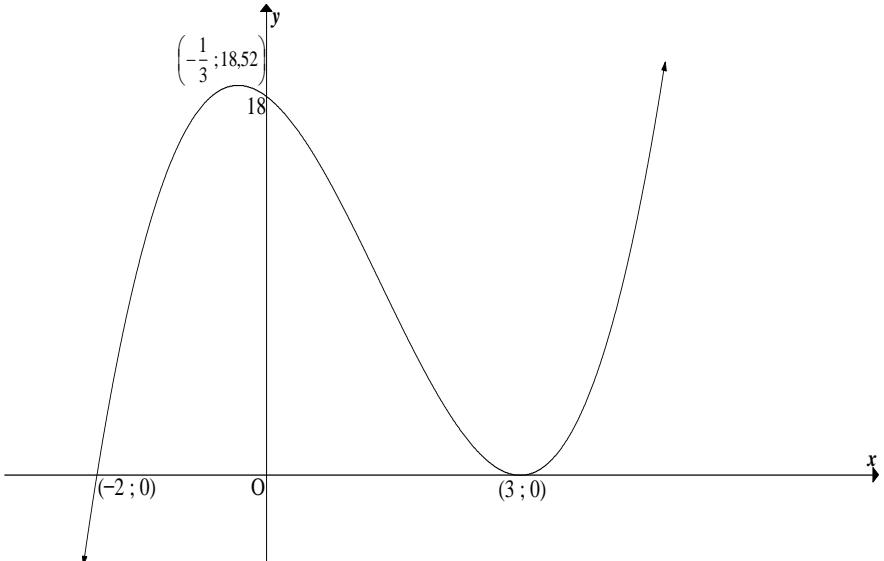
QUESTION/*VRAAG* 10

10.1	$l + 2h = 40$ $l = 40 - 2h$	✓ answer (1)
10.2	$2b + 2h = 100$ $b = 50 - h$ $V = lbh$ $V = h(40 - 2h)(50 - h)$	✓ $2b + 2h = 100$ ✓ $b = 50 - h$ ✓ volume formula (3)
10.3	$V = (50h - h^2)(40 - 2h)$ $V = 2h^3 - 140h^2 + 2000h$ $V' = 6h^2 - 280h + 2000 = 0$ $h = \dfrac{280 \pm \sqrt{(-280)^2 - 4(6)(2000)}}{2(6)}$ $h \neq 37,86$ or $h = 8,80$ $\therefore$ for a box as large as possible, $h = 8,80\,\text{cm}$ *vir die grootste moontlike boks = 8,80 cm*	✓ simplifying/*vereenvoudig* ✓ derivative / *afgeleide* ✓✓ h-values in any form / *h-waardes in enige vorm* ✓ answer/*antwoord* (5) **[9]**

QUESTION/*VRAAG* 11

11.1.1	$P(\text{male}/\textit{manlik}) = \dfrac{83}{180}$ or $0,46$ or $46,11\%$	✓ answer/*antwoord* (1)
11.1.2	P(not game park/*nie wildreservaat*) $= 1 - P(\text{game park}/\textit{wildreservaat})$ $= 1 - \dfrac{62}{180}$ $= \dfrac{59}{90}$ or $0,66$ or $65,56\%$ **OR/*OF*** P(not game park/*nie wildreservaat*) $= \dfrac{98}{180} + \dfrac{20}{180}$ $= \dfrac{118}{180}$ $= \dfrac{59}{90}$ or $0,66$ or $65,56\%$	✓ $1 - \dfrac{62}{180}$ ✓ answer/*antwoord* (2) ✓ $\dfrac{98}{180} + \dfrac{20}{180}$ ✓ answer/*antwoord* (2)

11.2	Events are independent if /*Gebeure is onafhanklike indien*	
	$P(\text{male}) \times P(\text{home}) = P(\text{male and home})$	✓$P(m) \times P(h)$
	$P(manlik) \times P(huis) = P(manlik\ en\ huis)$	and their values/*en hulle waardes*
	$P(\text{male}/manlik) = \dfrac{83}{180}$	
		✓answer of product
	and/*en* $P(\text{home}/huis) = \dfrac{20}{180}$ or 0,11 or 11,11%	
	$P(\text{male}/manlik) \times P(\text{home}/huis)$	
	$= \dfrac{83}{180} \times \dfrac{20}{180}$	
	$= \dfrac{83}{1620}$	
	$= 0,05123$ or 5,12%	
	$P(\text{male and home}/manlik\ en\ huis)$	✓$P(m\ \text{and}/en\ h)$
	$= \dfrac{13}{180}$	value/*waarde*
	$= 0,07222\ldots$ or 7,22%	
	Therefore $P(\text{male}) \times P(\text{home}) \neq P(\text{male and home})$	✓conclusion/*afleiding* (4)
	Dus $P(manlik) \times P(huis) \neq P(manlik\ en\ huis)$	
	Thus the events are not independent./*Dus is die gebeure nie onafhanklik nie*	
	OR/*OF*	

	Home/*Huis*	Not Home/ *Nie huis*	
M	13	70	83
F	7	90	97
	20	160	180

	$P(\text{female}/vroulik) \times P(\text{not home}/nie\ huis)$	✓$P(f) \times P(\text{not } h)$
	$= \dfrac{97}{180} \times \dfrac{160}{180}$	and their values/*en hulle waardes*
	$= \dfrac{194}{405}$	✓answer of product
	$= 0,479012345\ldots$ or 47,90%	
	$P(\text{female and not home}/vroulik\ en\ nie\text{-}huis)$	✓$P(f\ \text{and}/en\ \text{not } h)$
	$= \dfrac{90}{180}$	value/*waarde*
	$= 0,5$ or 50%	
	Therefore $P(\text{female}) \times P(\text{not home}) \neq P(\text{female and not home})$	
	Thus the events are not independent.	✓conclusion/*afleiding* (4)
	Dus $P(vroulik) \times P(nie\text{-}huis) \neq P(vroulik\ en\ nie\text{-}huis)$	
	Dus is die gebeure nie onafhanklik nie.	**[7]**

QUESTION/*VRAAG* 12

12.1.1	$26 \times 25 \times 24 \times 23 \times 22$ $= 7\ 893\ 600$ **OR/*OF*** $^{26}P_5 = \dfrac{26!}{(26-5)!} = \dfrac{26!}{21!} = 7\ 893\ 600$	✓ $26 \times 25 \times 24 \times 23 \times 22$ ✓ $7\ 893\ 600$ (2) ✓formula/*formule* ✓answer/*antwoord* (2)
12.1.2	$24 \times 23 \times 22$ $= 12\ 144$	✓ $24 \times 23 \times 22$ ✓ $12\ 144$ (2)
12.2.1	$7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$ $= 5\ 040$	✓product/*produk* ✓ $5\ 040$ (2)
12.2.2	$(3 \times 2 \times 1)(5 \times 4 \times 3 \times 2 \times 1)$ $= 720$ **OR/*OF*** The five 'units' can be parked in $5 \times 4 \times 3 \times 2 \times 1$ ways./*Die vyf 'eenhede' kan op $5 \times 4 \times 3 \times 2 \times 1$ maniere geparkeer word.* The three silver cars can be parked in $3 \times 2 \times 1$ ways./*Die drie silwer motors kan op $3 \times 2 \times 1$ maniere parkeer word.* So there are $(3 \times 2 \times 1)(5 \times 4 \times 3 \times 2 \times 1) = 720$ ways to park the cars./*Dus is daar $(3 \times 2 \times 1)(5 \times 4 \times 3 \times 2 \times 1) = 720$ maniere om die motors te parkeer.* **OR/*OF*** Suppose for the moment the 3 silver cars are at one end./*Veronderstel die drie silwer motors is op die punt.* The 3 cars can be arranged in $3 \times 2 \times 1 = 6$ ways./*Die 3 motors kan op $3 \times 2 \times 1 = 6$ maniere gerangskik word.* For each of them the remaining four cars can be arranged in $4 \times 3 \times 2 \times 1 = 24$ ways./*Die 4 oorblywende motors kan op $4 \times 3 \times 2 \times 1 = 24$ maniere rangskik word.* So $6 \times 24 = 144$ ways if all 3 cars at one end./*Dus is daar $6 \times 24 = 144$ maniere as die 3 motors op die punt is.* Together, the silver cars can only occupy 5 different positions amongst the 7 positions. ./*Saam kan die silwer motors slegs 5 verskillende posisies hê tussen die 7 moontlike posisies.* $\therefore$ Total ways/*Totale getal maniere* $= 5 \times 144 = 720$	✓ $3 \times 2 \times 1$ ✓ $5 \times 4 \times 3 \times 2 \times 1$ ✓ 720 (3) ✓ $5 \times 4 \times 3 \times 2 \times 1$ ✓ $3 \times 2 \times 1$ ✓ 720 (3) ✓ $6 \times 24 = 144$ ✓ 5×144 ✓ 720 (3) **[9]**
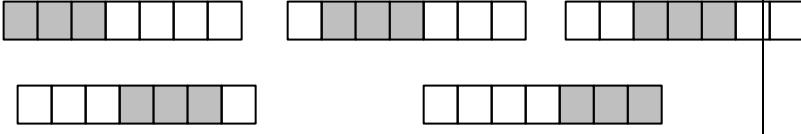
TOTAL/*TOTAAL*: 150