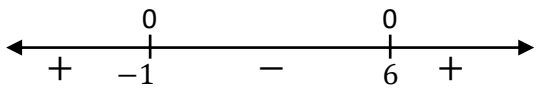
MEMORANDUM

QUESTION 1/*VRAAG 1*

		SUGGESTED ANSWER/ VOORGESTELDE ANTWOORD	DESCRIPTORS/BESKRYWERS	
1.1	1.1.1	$3x + \frac{1}{x} = 4$ $3x^2 - 4x + 1 = 0$ $(3x - 1)(x - 1) = 0$ $x = \frac{1}{3}$ or/of $x = 1$	✓standard form/*standaardvorm* ✓Factors/*faktore* ✓Both roots/ *Beide wortels*	(3)
	1.1.2	$x(5x - 1) = 2(7x + 1)$ $5x^2 - x = 14x + 2$ $5x^2 - 15x - 2 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{15 \pm \sqrt{(-15)^2 - 4(5)(-2)}}{2(5)}$ $= \frac{15 \pm \sqrt{265}}{10}$ $= 3{,}13$ or/of $-0{,}13$	✓standard form/ *standaard vorm* ✓Substitution/ *substitusie* ✓✓each root/ *elke wortel* (-1 vir verkeerde afronding slegs een maal in antwoordstel/-1 for incorrect rounding only once in paper)	(4)
	1.1.3	$6 \geq x(x - 5)$ $x^2 - 5x - 6 \leq 0$ $(x - 6)(x + 1) \leq 0$  $-1 \leq x \leq 6$	✓stdform/ *stdvorm* ✓factors/ *faktore* ✓zero points/nulpunte ✓answer with correct notation/antw met korrekte notasie	(4)
	1.1.4	$\sqrt{x-1} = 3\ of\ \sqrt{x-1} = -2$ wat onmoontlik is/which is not possible $x - 1 = 9$ $x = 10$	✓$\sqrt{x-1} = 3\ of\ \sqrt{x-1} = -2$ ✓$\sqrt{x-1} = -2$ not possible/nie moontlik ✓squared/kwadreer ✓ans/antw	(4)

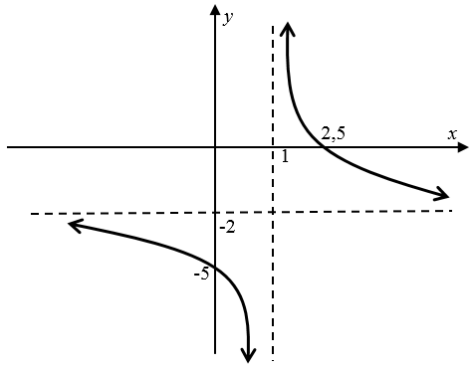
1.2		$f(x) = \sqrt{\frac{x^{2016}}{x^{2015} + x^{2012}}}$ $= \sqrt{\frac{(x^{2012})(x^4)}{x^{2012}(x^3+1)}}$ $= \sqrt{\frac{x^4}{x^3+1}}$ $= \sqrt{\frac{2^4}{(2)^3+1}} = \sqrt{\frac{16}{9}} = \frac{4}{3}$ $= \frac{4}{3}$	$f(x) = \sqrt{\frac{2^{2016}}{2^{2015} + 2^{2012}}}$ $= \sqrt{\frac{(2^{2012})(2^4)}{2^{2012}(2^3+1)}}$ $= \sqrt{\frac{2^4}{2^3+1}}$ $= \sqrt{\frac{2^4}{(2)^3+1}} = \sqrt{\frac{16}{9}}$ $= \frac{4}{3}$	✓factors/ *faktore* ✓Simplified/ *Vereenvoudig* ✓Substitute.*Vervang* $x = 2$/ ✓Ans/ *Antw* Or ✓Subst/ *Subst* ✓Factors/*Faktore* ✓Simplification/ *Vereenvoudig* ✓Ans./ *Antw*	(4)
1.3		$x - 3y = 1$ $\therefore x = 3y + 1$ $-2xy + 9y^2 = 17 - x^2$ Subst (1) into (2): $-2(3y+1)y + 9y^2 = 17 - (3y+1)^2$ $-6y^2 - 2y + 9y^2 = 17 - (9y^2 + 6y + 1)$ $12y^2 + 4y - 16 = 0$ $3y^2 + y - 4 = 0$ $(3y+4)(y-1) = 0$ $y = -\frac{4}{3}$ *or of* $y = 1$ Substitute into (1): $x = 3\left(-\frac{4}{3}\right) + 1$ *or of* $x = 3(1) + 1$ $x = -3$ $x = 4$		✓x subject/*onderwerp* ✓subst in (2) ✓standard form / *standaardvorm* ✓factors/ *faktore* ✓values of y / *Waardes van y* ✓values of x/ *Waardes van x*	(6)
					[25]

QUESTION 2/*VRAAG 2*

	SUGGESTED ANSWER/ VOORGESTELDE ANTWOORD	DESCRIPTORS/BESKRYWERS	
2.1.1	$0\ ;\ -1\ ;\ 1\ ;\ 6\ ;\ 14\ ;\ \ldots$ $-1 \quad 2 \quad 5 \quad 8$ - 1st differences $3 \quad 3 \quad 3$ - 2nd differences	✓ first differences/eerste verskille ✓ second differences / tweede verskille	(2)
2.1.2	Next term/volgende term = 25	✓ answer/antwoord	(1)
2.1.3	$2a = 3 \quad a + b = -1 \quad a + b + c = 0$ $a = \frac{3}{2} \quad 3\left(\frac{3}{2}\right) + b = -1 \quad \frac{3}{2} - \frac{11}{2} + c = 0$ $b = -\frac{11}{2} \quad c = 4$ $\therefore T_n = \frac{3}{2}n^2 - \frac{11}{2}n + 4$	✓$a = \frac{3}{2}$ ✓$b = -\frac{11}{2}$ ✓$c = 4$ ✓ answer/antwoord	(4)
2.2.1	$3\ ;\ 18$	✓3 ✓18	(2)
2.2.2	$S_{100} = 3 \times 50 + S_{50}$ $= 150 + \frac{50}{2}[2(2) + 49(4)]$ $= 150 + 5000$ $= 5150$	✓✓Subst. in S_{50} **(-1, if any fault)** ✓150(or 3x50) ✓5150	(4)
2.2.3	$T_n = 4n - 2$ $4n - 2 = 122$ $4n = 124$ $n = 31$ $\therefore n = 62$	✓ $4n - 2$ ✓$T_n = 122$ ✓$n = 31$ ✓Number of terms 62/terme is 62	(4)
2.3	$T_1 = 15$ $T_2 = 45$ $T_3 = 135$ $\frac{15(1-(3)^{n-1})}{1-(3)} = 1815$ or $\frac{15(3^n-1)}{3-1} = 1815$ $1 - (3)^{n-1} = \frac{1815(-2)}{15}$ $\therefore 3^n - 1 = 242$ $(3)^{n-1} = 243$ $\therefore 3^n = 243 = 3^5$ $(3)^{n-1} = 3^5$ $\therefore n - 1 = 5$ $\therefore n = 5$ $\therefore n = 6$ Reeks begin by/Series start at k=2 Dus $n = 6$	✓T_1, T_2, T_3 ✓Subst = 1815 **(-1, if any fault)** ✓Vgl. priem f/prime factors or logs ✓answer/antwoord n = 6	(4)
2.4.1	$r = k + 1$ $\therefore -1 < k + 1 < 1$ $\therefore -2 < k < 0$	✓$r = k + 1$ ✓Grense ✓Opl	(3)

2.4.2	$r = k + 1 = -\frac{1}{2} + 1 = \frac{1}{2}$ $S_\infty = \frac{a}{1-r}$ $= \frac{1}{1-\frac{1}{2}}$ $= 2$	✓Subst. in r ✓ answer/antwoord	(2)
			[26]

QUESTION 3/*VRAAG 3*

	SUGGESTED ANSWER/ VOORGESTELDE ANTWOORD	DESCRIPTORS/BESKRYWERS	
3.1.1	$y = -2$ (horizontal asymptote / horisontale asimptoot)	✓answer / antwoord	(1)
3.1.2	$x = 1$ (vertical asymptote / vertikale asimptoot)	✓answer / antwoord	(1)
3.2	$\frac{3}{x-1} - 2 = 0$ $\frac{3}{x-1} = 2$ $3 = 2x - 2$ $5 = 2x$ $x = \frac{5}{2}$ $y = \frac{3}{0-1} - 2$ $y = -5$	✓y = 0 ✓x – intercept / afsnit ✓y– intercept / afsnit	(3)
3.3		✓ asymptotes / asimptote ✓x-and y-intercepts/x-en$y$-afsnitte ✓ shape / vorm	(3)
3.4	(4 ; 5)	✓***x*** ✓***y***	(2)
			[10]

QUESTION 4/*VRAAG 4*

	SUGGESTED ANSWER/ VOORGESTELDE ANTWOORD	DESCRIPTORS/BESKRYWERS	
4.1	$y = a(x+p)^2 + q$ $(1;8)\ y = a(x-1)^2 + 8$ $(0;6) 6 = a(0-1)^2 + 8$ $-2 = a$ $y = -2(x-1)^2 + 8$ $= -2x^2 + 4x + 6$	✓*Subst.* $(1;8)$ ✓*Subst.* $(0;6)$ ✓ $-2 = a$ ✓Subst. a ✓$b = 4\ and\ c = 6$	(5)
4.2	$-2x^2 + 4x + 6 = 0$ $x^2 - 2x - 3 = 0$ $(x-3)(x+1) = 0$ $x = +3\ of\ x = -1$ $y = mx + 6$ $(3;0):\ 0 = m(3) + 6$ $m = -2$ $y = -2x + 6$	✓standard form/*standaardvorm* ✓Factors/*faktore* ✓Both roots/ *Beide wortels* ✓$m = -2$ ✓$c = 6$	(5)
4.3	$f^l(x) = -4x + 4 = -2$ $-4x = -6$ $x = \frac{6}{4}$ $x = \frac{3}{2}$ $y = -2(\frac{3}{2})^2 + 4(\frac{3}{2}) + 6$ $y = \frac{15}{2}$ $(\frac{3}{2}; \frac{15}{2})$	✓$f^l(x)$ ✓ $= -2$ ✓$x = \frac{3}{2}$ ✓$y = \frac{15}{2}$	(4)
4.4	$PQ = f(x) - g(x)$ $= -2x^2 + 4x + 6 - (-2x + 6)$ $= -2x^2 + 6x$	✓Subst. ✓answer / antwoord	(2)
4.5	$x < -1\ , x \epsilon R$	✓✓	(2)
4.6	$0 \leq x \leq 3\ , x \epsilon R$	✓✓	(2)
			[20]

QUESTION 5/*VRAAG 5*

	SUGGESTED ANSWER/ VOORGESTELDE ANTWOORD	DESCRIPTORS/BESKRYWERS	
5.1.1	$f(x) = a^x$ $\frac{27}{8} = a^3$ $\left(\frac{3}{2}\right)^3 = a^3$ $\therefore a = \frac{3}{2}$	✓ substitution / vervanging ✓ answer / antwoord	(2)
5.1.2	$y = \left(\frac{3}{2}\right)^x$ $x = \left(\frac{3}{2}\right)^y$ $y = log_{\frac{3}{2}}x$	✓swop x and y/ ruil x en y om ✓ answer/antwoord or/of ✓✓ **Only answer/antwoord alleen**	(2)
5.1.3	$x \epsilon R$	✓	(1)
			[5]

QUESTION 6/*VRAAG 6*

	SUGGESTED ANSWER/ VOORGESTELDE ANTWOORD	DESCRIPTORS/BESKRYWERS	
6.1.1	$\frac{10}{4} = 2{,}5\%$	✓2,5%	(1)
6.1.2	$(1+i_e) = (1+\frac{i^m}{m})^m$ $(1+i_e) = (1+\frac{10}{400})^4$ $i_e = 10{,}38\%$	✓Formule / Formula ✓Subst. ✓ answer/antwoord	(3)
6.2.1	$P = \frac{x[1-(1+i)^{-n}]}{i}$ $900000 = \frac{12000\left[1-\left(1+\frac{0{,}13}{12}\right)^{-n}\right]}{\frac{0{,}13}{12}}$ $\frac{13}{16} = 1-(\frac{1213}{1200})^n$ $\left(\frac{1213}{1200}\right)^n = \frac{3}{16}$ $n = \log_{\frac{1213}{1200}}\frac{3}{16}$ $= 155{,}36$ $n = 155$	✓✓Subst in correct formula/subst in korrekte formule ✓simplify/vereenv. ✓correct use of logs/korrekte gebruik van logs ✓$n = 155$	(5)
6.2.2 a	$Balans\ /Balance = A - F$ $= 900000(1+\frac{0{,}13}{12})^{48} - \frac{12000[\left(1+\frac{0{,}13}{12}\right)^{48}-1]}{\frac{0{,}13}{12}}$ $= R759324$	✓subst A ✓✓subst F **(-1, if any fault)** ✓ answer/antwoord	(4)
b	$\frac{759324}{35} \times 100$ $= R2169497$	✓ answer/antwoord (CA)	(1)
			[14]

QUESTION 7/*VRAAG 7*

	SUGGESTED ANSWER/ VOORGESTELDE ANTWOORD	DESCRIPTORS/BESKRYWERS	
7.1	$f(x) = 2x^2 - 3x$ $f(x+h) = 2(x+h)^2 - 3(x+h)$ $= 2(x^2 + 2xh + h^2) - 3(x+h)$ $= 2x^2 + 4xh + 2h^2 - 3x - 3h$ $f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h\to 0} \frac{2x^2 + 4xh + 2h^2 - 3x - 3h - (2x^2 - 3x)}{h}$ $= \lim_{h\to 0} \frac{2x^2 + 4xh + 2h^2 - 3x - 3h - 2x^2 + 3x}{h}$ $= \lim_{h\to 0} \frac{4xh + 2h^2 - 3h}{h}$ $= \lim_{h\to 0} \frac{h(4x + 2h - 3)}{h}$ $= \lim_{h\to 0} (4x + 2h - 3)$ $= 4x - 3$ Answer ONLY: 0 marks SLEGS antwoord: 0 punte	✓ substitute/vervang$(x+h)$ ✓simplify/vereenvoudig ✓ formula/formule Penalise 1 mark for incorrect use of formula and notation. Must show $f'(x)$. Penaliseer 1 punt vir verkeerde gebruik van formule en notasie. Moet $f'(x)$ toon. ✓simplification/vereenvoudiging ✓common factor/gemenefaktor ✓ answer/antwoord	(6)
7.2	$y = 2\sqrt{x} - \frac{3x}{5x^2}$ $y = 2x^{\frac{1}{2}} - \frac{3}{5}x^{-1}$ $\frac{dy}{dx} = x^{-\frac{1}{2}} + \frac{3}{5}x^{-2}$ $= \frac{1}{\sqrt{x}} + \frac{3}{5x^2}$	Penalise 1 mark for incorrect notation. Penaliseer 1 punt virverkeerdenotasie. ✓$2x^{\frac{1}{2}}$; $\frac{3}{5}x^{-1}$ ✓$x^{-\frac{1}{2}}$ ✓$\frac{3}{5}x^{-2}$	(3)
			[9]

QUESTION 8/*VRAAG 8*

	SUGGESTED ANSWER/ VOORGESTELDE ANTWOORD	DESCRIPTORS/BESKRYWERS	
8.1.1	$f(x) = x^3 - 4x^2 - 11x + 30$ $f'(x) = 3x^2 - 8x - 11 = 0$ $(3x - 11)(x + 1) = 0$ $3x - 11 = 0 \ or \ x + 1 = 0$ $x = \frac{11}{3} (3{,}7) \quad or \quad x = -1$ $y = -\frac{400}{27} (-14{,}8) \quad or \quad y = 36$ $A(-1\,;36)\&\quad B\left(\frac{11}{3}\,;-\frac{400}{27}\right)$ / (3,7 ; -14,8)	✓$f'(x)$ ✓$f'(x) = 0$ ✓ factors / faktore ✓x-values / waardes ✓y-values / waardes	(5)
8.1.2	$f''(x) = 6x - 8 = 0$ $6x = 8$ $x = \frac{8}{6}$ or/of $1\frac{1}{3}$ or/of $1,33$ OR $x = \frac{-1 + \frac{11}{3}}{2}$ $= \frac{4}{3}$ or/of 1,33	✓$f''(x) = 0$ ✓answer/antwoord	(2)
8.1.3	$m = f'(2) = 3(2)^2 - 8(2) - 11$ $= -15$ $f(2) = (2)^3 - 4(2)^2 - 11(2) + 30$ $= 0$ $y - y_1 = m(x - x_1)$ $y - 0 = -15(x - 2)$ $y = -15x + 30$	✓$m = -15$ ✓$f(2) = 0$ ✓ substitution / vervanging ✓ answer / antwoord	(4)
8.1.4	36 units downwards 14,8 units upwards	✓ answer / antwoord ✓ answer / antwoord	(2)
8.2.1	$m = -9$	✓ answer / antwoord	(1)
8.2.2	$x = 1 \ or \ x = 5$	✓✓ answers / antwoorde	(2)
			[16]

QUESTION 9/*VRAAG 9*

	SUGGESTED ANSWER/ VOORGESTELDE ANTWOORD	DESCRIPTORS/BESKRYWERS	
9.1	$V = x^2h$ $8 = x^2h$ $\therefore h = \frac{8}{x^2}$	✓ substitution / vervanging ✓ answer/antwoord	(2)
9.2	$A = 2x^2 + 4xh$ $= 2x^2 + 4x\left(\frac{8}{x^2}\right)$ $= 2x^2 + \frac{32}{x}$ No mark for the answer / Geen punt vir die antwoord	✓$2x^2$ ✓$4xh$ ✓substitution / vervanging	(3)
9.3	$A(x) = 2x^2 + 32x^{-1}$ $A'(x) = 4x - 32x^{-2} = 0$ $4x^3 - 32 = 0$ $4x^3 = 32$ $x^3 = 8$ $= 2^3$ $\therefore x = 2$ Sye/sides = 2m en/and h=2m	✓$A'(x) = 0$ ✓standard form / standaardvorm ✓ value of *x* / waarde van *x* ✓ dimensions / dimensies	(4)
			[9]

QUESTION 10/*VRAAG 10*

	SUGGESTED ANSWER/ VOORGESTELDE ANTWOORD	DESCRIPTORS/BESKRYWERS	
10.1.1	(a) $P(V) = \frac{70}{150} = 0{,}47$	✓ratio/verh ✓ans/antw	(2)
	(b) $P(V \cap T) = \frac{20}{150} = 0{,}13$	✓ans/antw	(1)
10.1.2	To be independent/Om onafhanklik te wees: $P(V \cap T) = P(T) \times P(V)$ LK: $P(V \cap T) = 0{,}13$ RK: $P(T) \times P(V) = \frac{70}{150} \times \frac{70}{150} = 0{,}22$ $\therefore LK \neq RK$ Not independent/nie onafhanklik	✓formula ✓products/produkte ✓ans/antw ✓Conclusion/gevolgtrekking	(4)
10.2.1	7! = 5040	✓Telbeginsel ✓ answer /antwoord	(2)
10.2.2	$1 \times 5! \times 1 = 120$	✓Telbeginsel ✓ answer /antwoord	(2)
10.2.3	$4! \times 4! = 576$	✓4! ✓4! ✓ answer /antwoord	(3)

10.2.4	$\frac{7!}{(7-4)!} = 840$ or 7x6x5x4=840	✓Telbeginsel ✓ answer /antwoord	(2)
			[16]
TOTAL/TOTAAL: 150			