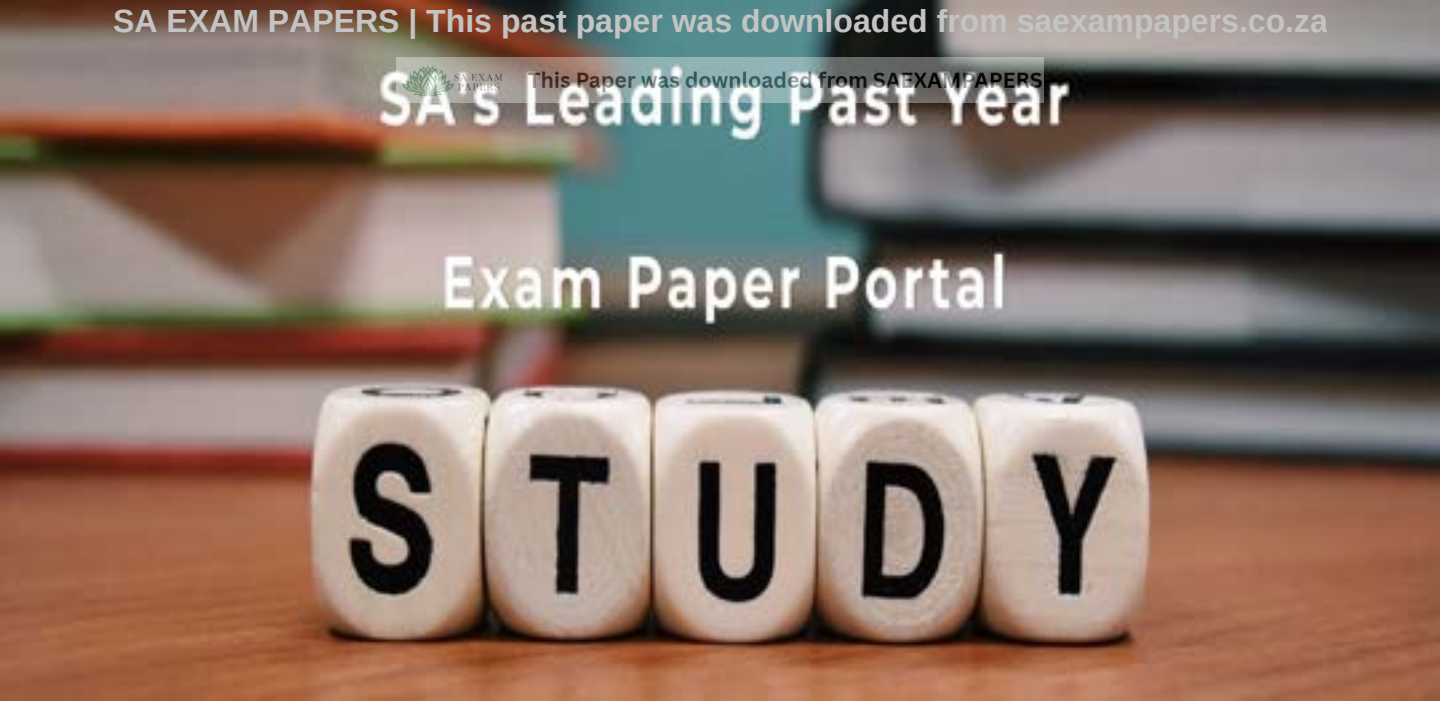


QUESTION 1

1.1	Sequence: $-80\ ;\ -63\ ;\ -48\ ;\ \ldots$		
	1.1.1	$-35\ ;\ -24$ ✓	(1)
	1.1.2	$-80 \quad -63 \quad -48$ $17 \quad 15$ -2 $2a = -2$ $\quad 3(-1) + b = 17$ $\quad 1 + 20 + c = -80$ $\therefore a = -1$ ✓ $\quad \therefore b = 20$ ✓ $\quad \therefore c = -99$ ✓ $\therefore T_n = -n^2 + 20n - 99$	(3)
	1.1.3	$T_{n+1} - T_n = [-(n+1)^2 + 20(n+1) - 99\,] - \ [-n^2 + 20n - 99]$ $-103 = -n^2 - 2n - 1 + 20n + 20 - 99 + n^2 - 20n + 99$ ✓ $-103 = -2n - 1 + 20$ $2n = 122$ $\therefore n = 61$ ✓ $\therefore$ Between $\boldsymbol{T_{61}}$ and $\boldsymbol{T_{62}}$. ✓	(3)
1.2	$16(p-3)^3\ ;8(p-3)^4\ ;4(p-3)^5\ ;\ldots\ldots\ldots \quad p \neq 3$		
	1.2.1	$r = \dfrac{8(p-3)^4}{16(p-3)^3}$ $r = \dfrac{p-3}{2}$ ✓ $-1 < r < 1$ ✓ $-1 < \dfrac{(p-3)}{2} < 1$ $-2 < p - 3 < 2$ $-2 + 3 < p < 2 + 3$ $1 < p < 5$ ✓	(3)

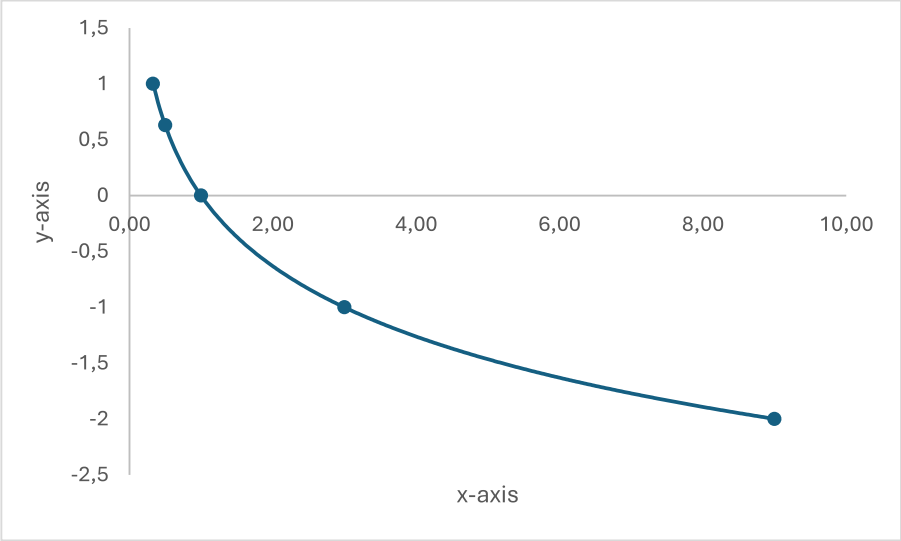
	1.2.2	$r = \frac{3,5-3}{2} = \frac{1}{4}$ $T_1 = 16\left(\frac{1}{2}\right)^3 = 2$ ✓ $S_\infty = \frac{a}{1-r} = \frac{2}{1-\frac{1}{4}} = \frac{8}{3}$ ✓	(2)
			[12]

QUESTION 2

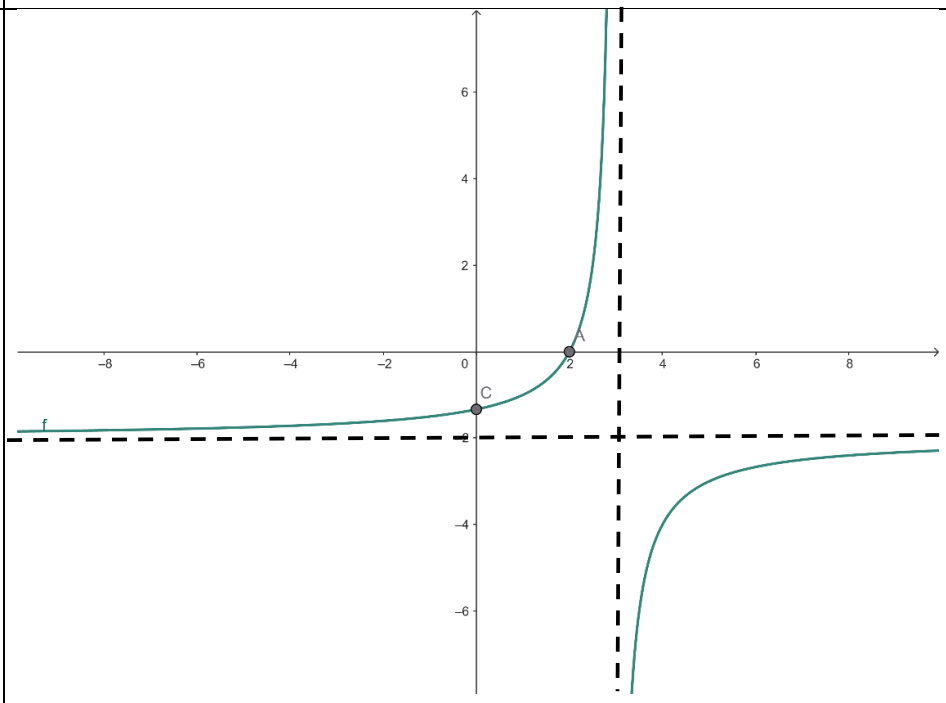
2.1	$S_n = 4n^2 + 6n$		
	2.1.1	$S_1 = 4(1)^2 + 6(1) = 10$ $\therefore T_1 = 10$ $S_2 = 4(2)^2 + 6(2) = 28$ $\therefore T_2 = S_2 - S_1 = 28 - 10 = 18$ $S_3 = 4(3)^2 + 6(3) = 54$ $\therefore T_2 = S_3 - S_2 = 54 - 18 = 26$ $\therefore 10\,;18\,;26$ ✓✓	(2)
	2.1.2	Last term $(l) = 58$ $T_n = S_n - S_{n-1}$ $= (4n^2 + 6n) - \left(4(n-1)^2 + 6(n-1)\right) = 8n + 2$ ✓ $\therefore T_n = 58$ $8n + 2 = 58$ ✓ $n = 7$ Therefore; 7 terms. ✓	(3)
	2.1.3	$\sum_{k=1}^{n}(8k + 2)$ ✓✓✓	(3)
2.2	$S_5 = 62$ and $S_\infty = 64$ $S_\infty = \frac{a}{1-r}$ $64 = \frac{a}{1-r}$ $\therefore a = 64(1-r)$ ✓ $S_5 = \frac{a(1-r^5)}{1-r}$ $62 = \frac{64(1-r)(1-r^5)}{1-r}$ ✓ $62 = 64(1-r^5)$ $r^5 = \frac{1}{32}$ ✓		

	$r = \sqrt[5]{\frac{1}{32}} = \frac{1}{2}$ ✓		(4)
2.3	5000 ; 4000 ; 3200 ; 2560 ; 2048		
	2.3.1	R2 560 ✓	(1)
	2.3.2	$S_n = \frac{a(r^n - 1)}{r - 1}$ $= \frac{5000(0{,}8^5 - 1)}{0{,}8 - 1}$ ✓✓ $=$ R16 808 ✓	(3)
	2.3.3	$S_n \leq 22\,000$ $\frac{5000(0{,}8^n - 1)}{0{,}8 - 1} \leq 22\,000$ $-25000(0{,}8^n - 1) \leq 22\,000$ $(0{,}8^n - 1) \geq -\frac{22}{25}$ $0{,}8^n \geq 0{,}12$ $n \log(0{,}8) \geq \log(0{,}12)$ $n \leq \frac{\log 0{,}12}{\log 0{,}8} \approx 9{,}50$ Therefore; the largest integer n that satisfies this is 9 days.	(3)
			[18]

QUESTION 3

3.1	$x\epsilon R$ or $x\epsilon(-\infty\,;\,\infty)$ ✓	(1)
3.2	$y > 0$ or $y\epsilon(0\,;\,\infty)$ ✓	(1)
3.3	$y = \left(\frac{1}{3}\right)^x$ $x = \left(\frac{1}{3}\right)^y$ ✓ $\log x = y \log\left(\frac{1}{3}\right)$ $\therefore y = \log_{\frac{1}{3}} x$ ✓	(2)
3.4		
3.5	For $y = \log_{\frac{1}{3}} x$, vertical asymptote is $x = 0$. Replacing x by $x + 2$ shifts left by 2: $\therefore x = -2$ ✓✓	
		[9]

QUESTION 4

4.1	$(y+2)(x-3)=-2$ $y+2=\dfrac{-2}{x-3}$ $\therefore y=\dfrac{-2}{x-3}-2$ $\therefore p=3$ ✓ and $q=-2$ ✓	(2)
4.2	$x-$ intercept: $(0+2)(x-3)=-2$ $\therefore x=2$ $(2\,;0)$ ✓ $y-$ intercept: $(y+2)(0-3)=-2$ $\therefore y=-\dfrac{4}{3}$ $\left(0\,;-\dfrac{4}{3}\right)$ ✓	(3)
4.3		(3)
4.4	$(y+2)\big((x+2)-3\big)=-2$ $(y+2)(x-1)=-2$ $\therefore g(x)=\dfrac{-2}{x-1}-2$ $\therefore x=1$	(1)

4.5	$(3\,;\,-2)$ $-2 = -3 + c$ ✓ $\therefore c = 1$ ✓		(2)
			[11]

QUESTION 5

5.1	$f(x) = 0$ $x^2 - 6x - 16 = 0$ ✓ $(x - 8)(x + 2) = 0$ ✓ $x = 8$ or $x = -2$ ✓ $\therefore$ AB $= 8 - (-2)$✓ $= 10$ ✓	(4)
5.2	$f(x) = g(x)$ $-x - 2 = x^2 - 6x - 16$ ✓ $x^2 - 5x - 14 = 0$ $(x - 7)(x + 2) = 0$ ✓ $x_Q = 7$ or $x = -2$ ✓ $y_Q = -7 - 2 = -9$ $\therefore$ Q$(7\ ;\ -9)$ ✓	(4)
5.3	$x_{TP} = -\frac{b}{2a} = \frac{6}{2} = 3$ ✓ $y_{TP} = g(3) = 9 - 18 - 16 = -25$ ✓ $\therefore$ TP$(3\ ;\ -25)$	(2)
5.4	$f(x) > g(x)$ $-x - 2 > x^2 - 6x - 16$ ✓ $x^2 - 5x - 14 < 0$ $(x - 7)(x + 2) < 0$ $-2 < x < 7$ ✓	(2)
5.5	$\Delta = 0$ ✓ $(-6)^2 - 4(1)(k + 4) = 0$ $36 - 4k - 16 = 0$ $20 - 4k = 0$ $\therefore k = 5$ ✓	(2)
		[14]

QUESTION 6

6.1	$\sin 56° = \frac{q}{1}$ $r^2 = x^2 + y^2$ $1 = x^2 + q^2$ $\therefore x = \sqrt{1-q^2}$ ✓		
	6.1.1	$\sin(-56°) = -\sin 56°$ ✓ $= -q$ ✓	(3)
	6.1.2	$\tan 124° = \tan(180° - 56°)$ $= -\tan 56°$ ✓ $= -\frac{\sin 56°}{\cos 56°}$ ✓ $= -\frac{q}{\sqrt{1-q^2}}$ ✓	(3)
	6.1.3	$\cos 4° = \cos(60° - 56°)$ ✓ $= \cos 60° \cos 56° + \sin 60° \sin 56°$ ✓ $= \frac{1}{2}\sqrt{1-q^2} + \frac{\sqrt{3}}{2}.q$ ✓✓	(4)
6.3	$\sin(A - B)$ $= \cos[90° - (A - B)]$ ✓ $= \cos[(90° - A) - (-B)]$ $= \cos(90° - A)\cos(-B) + \sin(90° - A)\sin(-B)$ ✓ $= \sin A \cos B + \cos A(-\sin B)$ ✓ $= \sin A \cos B - \cos A \sin B$ ✓ **OR** $\sin(A - B)$ $= \cos[90° - (A - B)]$ ✓ $= \cos[(90° + B) - A]$ ✓ $= \cos(90° + B)\cos A + \sin(90° + B)\sin A$ ✓ $= \sin A \cos B - \cos A \sin B$ ✓		(4)

6.3	$\dfrac{\sin 2A \,.\, \cos(-A) + \cos(180° + 2A)\sin A}{\sin(A - 90°)}$ $= \dfrac{\sin 2A \,.\, \cos A - \cos 2A \sin A}{-\cos A}$ ✓✓✓ $= \dfrac{\sin(2A - A)}{-\cos A}$ ✓ $= \dfrac{\sin A}{-\cos A}$ $= -\tan A$ ✓		(5)
6.4	$\dfrac{\cos 2x + \cos^2 x + 3\sin^2 x}{2 - 2\sin^2 x} = \dfrac{1}{\cos^2 x}$		
	6.4.1	$LHS = \dfrac{\cos 2x + \cos^2 x + 3\sin^2 x}{2 - 2\sin^2 x}$ $= \dfrac{\cos^2 x - \sin^2 x + \cos^2 x + 3\sin^2 x}{2(1 - \sin^2 x)}$ ✓✓ $= \dfrac{2\cos^2 x + 2\sin^2 x}{2\cos^2 x}$ ✓ $= \dfrac{2(1)}{2\cos^2 x}$ ✓ $= \dfrac{1}{\cos^2 x}$ ✓	(5)
	6.4.2	Undefined when: $\cos^2 x = 0$ ✓ $\cos x = 0$ $\therefore x = 90°$ ✓	(2)

6.5	$\tan 1° \times \tan 2° \times \tan 3° \times \tan 4° \times \ldots\ldots\ldots \times \tan 87° \times \tan 88° \times \tan 89°$ Pairing complementary angles: $\underbrace{[\tan 1° \times \tan 89°] \times [\tan 2° \times \tan 88°] \times [\tan 3° \times \tan 87°] \times \ldots\ldots}_{44 \text{ pairs}} \times \tan 45°$ ✓ **Since:** $\tan 1° \times \tan 89° = \tan 1° \times \tan(90° - 1°)$ $= \frac{\sin 1°}{\cos 1°} \times \frac{\sin(90° - 1°)}{\cos(90° - 1°)}$ $= \frac{\sin 1°}{\cos 1°} \times \frac{\cos 1°}{\sin 1°}$ $= 1$ ✓ Therefore: $[1] \times [1] \times [1] \times \ldots\ldots\ldots \times \tan 45° = 1^{44} \times \tan 45°$ ✓ $= 1^{44} \times 1$ $= 1$ ✓	(4)
		[30]

QUESTION 7

7.1	7.1.1	Since $AD = BD$, ΔABD is isosceles with base AB. $\therefore \Delta B\hat{A}D = \Delta D\hat{B}A = \alpha$ ✓ $B\hat{A}D + D\hat{B}A + A\hat{D}B = 180°$ $\alpha + \alpha + A\hat{D}B = 180°$ ✓ $A\hat{D}B = 180° - 2\alpha$ ✓	(3)
	7.1.2	In ΔABD: $AD = BD = 4$, $AB = 6$. $\cos A\hat{D}B = \frac{AD^2 + BD^2 - AB^2}{2(AD)(BD)}$ $= \frac{(4)^2 + (4)^2 - (6)^2}{2(4)(4)}$ ✓ $= \frac{16 + 16 - 36}{32}$ $= -\frac{1}{8}$ $\cos(180° - 2\alpha) = -\frac{1}{8}$ ✓ $-\cos 2\alpha = -\frac{1}{8}$ $\cos 2\alpha = \frac{1}{8}$ ✓	(3)
			[6]