



KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

MATHEMATICS PRACTICE PAPER 1

MARKING GUIDELINES



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QUESTION 1

No.	SOLUTION	MARK JUSTIFICATION	MARK
1.1.1	$(x-2)(5+x)=0$ $x=2$ or $x=-5$	A ✓ $x=2$ A ✓ $x=-5$	(2)
1.1.2	$3x^2-2x-6=0$ $x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(3)(-6)}}{2(3)}$ $x = \frac{1 \pm \sqrt{19}}{3}$ $x = -1,12$ or $x = 1,79$	A ✓ substitution CA ✓ simplification CA ✓ $x = -1,12$ CA ✓ $x = 1,79$	(4)
1.1.3	$2\sqrt{x+6}+2=x$ $2\sqrt{x+6}=x-2$ $4(x+6)=(x-2)^2$ $4x+24=x^2-4x+4$ $x^2-8x-20=0$ $(x-10)(x+2)=0$ $x=10$ or $x=-2$	A ✓ isolating the surd CA ✓ $4x+24=x^2-4x+4$ CA ✓ $x=10$ CA ✓ $x \neq -2$	(4)
1.1.4	$x^2+2x-15<0$ $(x-3)(x+5)<0$ $x=3$ or $x=-5$ $-5<x<3$	A ✓ standard form CA ✓ critical values CA CA ✓✓ answer	(4)
1.1.5	$2^{x+2}-3 \cdot 2^{x-1}=80$ $2^x(2^2-3 \cdot 2^{-1})=80$ $2^x\left(\frac{5}{2}\right)=80$ $2^x=32$ $2^x=2^5$ $x=5$	A ✓ factorization CA ✓ simplifying bracket A ✓ $2^x=32$ CA ✓ Exponential form CA ✓ answer	(5)

1.2	$3^{x+y} = 27 \dots\dots\dots(1)$ $x^2 + y^2 = 17 \dots\dots\dots(2)$ $3^{x+y} = 3^3$ $x + y = 3$ $y = 3 - x \dots\dots\dots(3)$ sub.(3) into (2) $x^2 + (3 - x)^2 = 17$ $2x^2 - 6x - 8 = 0$ $x^2 - 3x - 4 = 0$ $(x - 4)(x + 1) = 0$ $x = 4$ or $x = -1$ $y = -1$ or $y = 4$	A ✓ $3^{x+y} = 3^3$ CA ✓ $x + y = 3$ CA ✓ substitution CA ✓ standard form CA ✓ x values CA ✓ y values	(6)
1.3	$2 \cdot 5^n - 5^{n+1} + 5^{n+2} = 2 \cdot 5^n - 5^n \cdot 5^1 + 5^n \cdot 5^2$ $= 5^n (2 - 5 + 25)$ $= 5^n (22)$ $= 2 [5^n (11)]$ OR Any integer multiplied by an even number will be even.	A ✓ exp. law CA ✓ common factor CA ✓ answer/explanation	(3)
1.4	$\frac{3^{y+1}}{32} = \sqrt{96^x}$ $\frac{3^{y+1}}{2^5} = (96)^{\frac{x}{2}}$ $3^{y+1} \cdot 2^{-5} = 2^{\frac{5x}{2}} \cdot 3^{\frac{x}{2}}$ $-5 = \frac{5x}{2}$ $\therefore x = -2$ $y+1 = \frac{x}{2}$ $y+1 = \frac{-2}{2}$ $\therefore y = -2$	A ✓ $\frac{3^{y+1}}{2^5} = (96)^{\frac{x}{2}}$ A ✓ $3^{y+1} \cdot 2^{-5} = 2^{\frac{5x}{2}} \cdot 3^{\frac{x}{2}}$ CA ✓ $x = -2$ CA ✓ $y = -2$	(4)

OR $\frac{3^{y+1}}{32} = \sqrt{96^x}$ $\left(\frac{3^{y+1}}{2^5}\right)^2 = (\sqrt{96^x})^2$ $\frac{3^{2y+2}}{2^{10}} = 2^{5x} \cdot 3^x$ $3^{2y+2} \cdot 2^{-10} = 2^{5x} \cdot 3^x$ $-10 = 5x$ $\therefore x = -2$ $2y + 2 = -2$ $\therefore y = -2$	OR $A \checkmark \left(\frac{3^{y+1}}{2^5}\right)^2 = (\sqrt{96^x})^2$ $A \checkmark 3^{2y+2} \cdot 2^{-10} = 2^{5x} \cdot 3^x$ $CA \checkmark x = -2$ $CA \checkmark y = -2$	(4)
[32]		

QUESTION 2

2.1.1	-120 -90 -80 -63 21 19 17 -2 -2 The next TWO terms: -48 ; -35	A✓ -48 A✓ -35	(2)
2.1.2	$2a = -2 \quad 3a + b = 21 \quad a + b + c = -120$ $a = -1 \quad 3(-1) + b = 21 \quad (-1) + (24) + c = -120$ $b = 24 \quad c = -143$ $T_n = -2n + 24n + 143$	A✓ 2nd diff = -2 CA✓ a = -1 CA✓ b = 24 CA✓ c = -143	(4)
2.1.3	$T'(n) = -2n + 24 = 0$ $n = 12$ $T_n = -(12)^2 + 24(12) - 143$ $T_n = 1$ A maximum of 1 Add -1 to T_n OR	A✓ method A✓ n = 12 CA✓ maximum 1 CA✓ -1 A✓ method A✓ n = 12	(4)

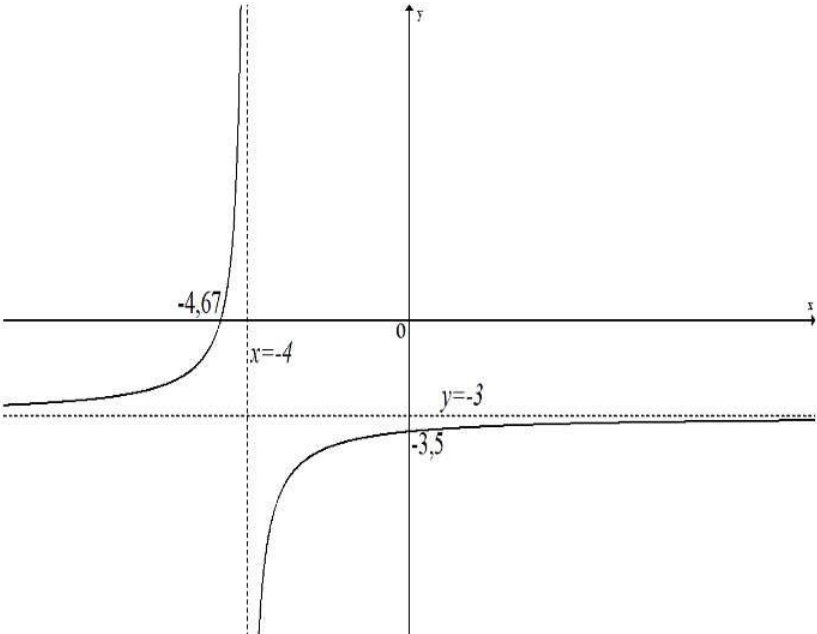
	$n = \frac{-(24)}{2(-1)} = 12$ $T_n = -(12)^2 + 24(12) - 143$ $T_n = 1$ A maximum of 1 Add -1 to T_n OR $T_n = -n^2 + 23n - 143 + k$ $\Delta = (24)^2 - 4(-1)(k - 143)$ $= 4k + 4$ but $\Delta = 0$, $4k + 4 = 0$ $k = -1$	CA✓ maximum 1 CA✓ -1 A✓ method CA✓ $\Delta = 4k + 4$ CA✓ $\Delta = 0$ CA✓ -1	(4) (4)
			[10]

QUESTION 3

3.1.1	$9 + 14 + 19 + \dots + 124$ $T_n = (9) + (n-1)(5)$ $T_n = 5n + 4$	A✓ substitution into the correct formula A✓ $T_n = 5n + 4$	(2)
3.1.2	$T_n = 5n + 4 = 124$ $5n = 120$ $n = 24$ $\sum_{n=1}^{24} (5n + 4)$	CA✓ = 124 CA✓ $n = 24$ CA✓ answer	(3)
3.2	$S_n = a + a + d + a + 2d + \dots + a + (n-2)d + a + (n-1)d$ $S_n = a + (n-1)d + a + (n-2)d + \dots + a + 2d + a + d$ (1) + (2) $2S_n = 2a + (n-1)d + 2a + (n-1)d + \dots + 2a + (n-1)d$ $2S_n = n[2a + (n-1)d]$ $S_n = \frac{n}{2}[2a + (n-1)d]$	A✓ equation 1 + a(2) A✓ equation 2 A✓ adding A✓ $2S_n = n[2a + (n-1)d]$	(4)

			[9]
QUESTION 4			
4.1.1	$5; 10; 20; \dots$ $T_n = ar^{n-1}$ $T_n = (5)(2)^{n-1}$	A✓ answer	(1)
4.1.2	$S_n = \frac{a(r^n - 1)}{r - 1}$ $S_{18} = \frac{5[(2)^{18} - 1]}{2 - 1}$ $S_{18} = 1\,310\,715$	A✓ substitution into the correct formula A✓ answer	(2)
4.2	$r = \frac{(2x+4)(2x-4)}{2x-4}$ $r = 2x+4$ converge : $-1 < r < 1$ $-1 < 2x+4 < 1$ $-5 < 2x < -3$ $-\frac{5}{2} < x < -\frac{3}{2}$	A✓ $r = 2x+4$ A✓ $-1 < r < 1$ A✓ substitution A✓ answer	(4)
4.3	$\frac{S_\infty}{S_2} = \frac{\frac{2}{1 - \frac{1}{\sqrt{2}}}}{2 \left(1 - \left(\frac{1}{\sqrt{2}} \right)^2 \right)}$ $= \frac{1}{1 - \frac{1}{2}}$ $= 2$	A✓ S_∞ A✓ S_2 A✓ answer	(3)
			[10]

QUESTION 5

5.1	$x+1=-x-7$ $2x=-8$ $x=-4$ $\therefore y=-3$ $\therefore f(x)=\frac{-2}{x+4}-3$ $\therefore p=4 \text{ and } q=-3$	✓ $x+1=-x-7$ A ✓ $x=-4$ A ✓ $\therefore y=-3$ A	(3)
5.2	$f(x)=\frac{-2}{x+4}-3$ $0=\frac{-2}{x+4}-3$ $-2-3(x+4)=0$ $-3x-14=0$ $\therefore x=-\frac{14}{3}$	✓ $y=0$ A ✓ $x=-\frac{14}{3}$ CA	(2)
5.3		✓ Horizontal asymptote A ✓ Vertical asymptote A ✓ Y-intercept CA ✓ Shape A	(4)

5.4	$h(x) = \frac{-2}{(x+5+4)} - 3$ $h(x) = \frac{-2}{(x+9)} - 3$ $x = -9$	✓ $h(x) = \frac{-2}{(x+5+4)} - 3$ A ✓ $x = -9$ CA	(2)
5.5	$-\frac{14}{3} < x < -4$	✓ Correct inequality A ✓ Critical values CA	(2)
[13]			

QUESTION 6

6.1	$(0 ; 3)$	✓ $(0 ; 3)$ A	(1)
6.2	$x = -\frac{b}{2a}$ $x = -\frac{(-2)}{2(-1)}$ $x = -1$ $y = -(-1)^2 - 2(-1) + 3$ $y = 4$	✓ $x = -\frac{(-2)}{2(-1)}$ A ✓ Simplification A ✓ In the context of a turning point A	(3)
6.3	B(1 ; 0) by symmetry A(-3 ; 0)	✓ A(-3 ; 0) A	(1)

6.4	$m = \frac{4-0}{-1+3}$ $= 2$ $y-0 = 2(x+3)$ $y = 2x+6$ $E(0; 6)$ $C(-1; 4)$ $CE = \sqrt{(0+1)^2 + (6-4)^2}$ $= \sqrt{5} \text{ units}$	✓ $m = 2$ CA ✓ subs of $A(-3; 0)$ or $C(-1; 4)$ A ✓ $y = 2x+6$ CA ✓ $E(0; 6)$ CA ✓ Substitution into distance formula CA ✓ Answer CA	(6)
6.5	$f'(x) = -2x - 2 \text{ but } m_{\tan} = 2$ $2 = -2x - 2$ $x = -2$ $f(-2) = 3$ $y = 2x + k$ $3 = 2(-2) + k$ $k = 7$	✓ $-2x - 2$ A ✓ $2 = -2x - 2$ A ✓ $x = -2$ CA ✓ $y = 3$ CA ✓ Answer CA	(5)
6.6	$g(x) = 2x + 6$ $x = 2y + 6$ $2y = x - 6$ $y = \frac{x}{2} - 3$	✓ $x = 2y + 6$ A ✓ $y = \frac{x}{2} - 3$ A	(2)
6.7	$2x + 6 \geq \frac{x-6}{2}$ $4x + 12 \geq x - 6$ $x \geq -6$	✓ $2x + 6 \geq \frac{x-6}{2}$ CA ✓ $4x + 12 \geq x - 6$ CA ✓ $x \geq -6$ CA	(3)
			[21]

QUESTION 7

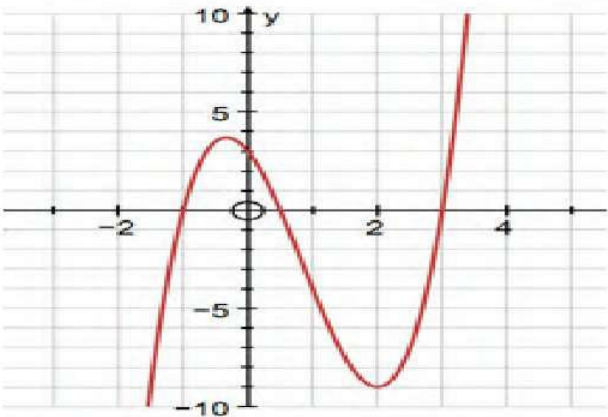
7.1	$-1 = \log_a \frac{1}{3}$ $a^{-1} = \frac{1}{3}$ $a = \left(\frac{1}{3}\right)^{-1}$ $\therefore a = 3$	✓ sub $\left(\frac{1}{3}; -1\right)$ A ✓ $a = \left(\frac{1}{3}\right)^{-1}$ A	(2)
7.2	$x = \log_3 y$ $y = 3^x$	✓ Swop x and y A ✓ Answer A	(2)
7.3	$g(x) = -\log_3 x$	✓ Answer A	(1)
7.4	$x > 0$	✓ Answer A	(1)
7.5	$\log_3 x = -3$ $x = 3^{-3}$ $x = \frac{1}{27}$ $x \geq \frac{1}{27}$	✓ exponential form A ✓ simplification A ✓ answer CA	(3)
			[09]

QUESTION 8

8.1	$f(x+h) = 3(x+h)^2 - 2$ $= 3(x^2 + 2xh + h^2) - 2$ $= 3x^2 + 6xh + 3h^2 - 2$	A✓ $f(x+h)$ CA✓ substitution in the correct formula CA✓ $\frac{6xh + 3h^2}{h}$ CA✓ $\frac{h(6x + 3h)}{h}$ CA✓ $6x$	
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	$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{3x^2 + 6xh + 3h^2 - 2 - (3x^2 - 2)}{h}$ $= \lim_{h \rightarrow 0} \frac{6xh + 3h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(6x + 3h)}{h}$ $= \lim_{h \rightarrow 0} 6x + 3h$ $= 6x$		(5)
8.2.1	$\frac{dy}{dx} = 18x^2 - 10x + 13$	A✓ $18x^2$ A✓ $-10x$ A✓ 13	(3)
8.2.2	$D_x [8x^2 + 2x^{-3}]$ $= 16x - 6x^{-4}$	A✓ $2x^{-3}$ CA✓ $-6x^{-4}$ A✓ $16x$	(3)
8.2.3	$m = 6x^2 - 4x + 4$ when $x = 2$ $m = 6(2)^2 - 4(2) + 4$ $= 20$ $f(2) = 15$ $y = mx + c$ $15 = 20(2) + c$ $c = -25$ $\therefore y = 20x - 25$	A✓ $m = 6x^2 - 4x + 4$ A✓ $f(2) = 15$ CA✓ $15 = 20(2) + c$ CA✓ $y = 20x - 25$	(4)
			[15]

QUESTION 9

9.1.1	$2x^3 - 5x^2 - 4x + 3 = 0$ $(x - 3)(x + 1)(2x - 1) = 0$ $x = 3$ or $x = \frac{1}{2}$ or $x = -1$ $(3; 0), \left(\frac{1}{2}; 0\right)$ and $(-1; 0)$	A✓ factors A✓ equating to 0 CA✓ x values CA✓ coordinates	(4)
9.1.2	(0;3)	A✓ (0;3)	(1)
9.1.3	$f'(x) = 6x^2 - 10x - 4$ $f'(x) = 0$ $6x^2 - 10x - 4 = 0$ $(x - 2)(3x + 1) = 0$ $x = 2$ or $x = -\frac{1}{3}$ $f(2) = -9$ $f\left(-\frac{1}{3}\right) = \frac{100}{27}$ $\therefore$ TP are $(2; -9)$ and $\left(-\frac{1}{3}; \frac{100}{27}\right)$	A✓ $f'(x) = 6x^2 - 10x - 4$ CA✓ factors and equation to 0 CA✓ x values CA✓ y values	(4)
9.1.4		A✓ shape CA✓ intercepts CA✓ turning points	(3)
9.2.1	concave up	A✓ $f''(x) > 0$ CA✓ $12x - 10 > 0$	

	$f''(x) > 0$ $12x - 10 > 0$ $x > \frac{5}{6}$	CA✓ $x > \frac{5}{6}$	(3)
9.2.2	$x < -\frac{1}{3}$ or $x > 2$	CACA✓✓ $x < -\frac{1}{3}$ CA✓ $x > 2$	(3)

QUESTION 10

10.1	$h(x) = a(x-1)(x-3)(x-5)$ $a = 1$ $h(x) = (x-1)(x^2 - 8x + 15)$ \ $= x^3 - 8x^2 + 15x - x^2 + 8x - 15$ $= x^3 - 9x^2 + 23x - 15$ $b = 9 \quad c = 23 \quad d = 15$	A✓ $a(x-1)(x-3)(x-5)$ A✓ $x^3 - 9x^2 + 23x - 15$ CA✓ $b = 9$ CA✓ $c = 23$ CA✓ $d = 15$	(5)
10.2	$1 \leq x \leq 3$ or $x \geq 5$	CACA✓✓ $1 \leq x \leq 3$ CA✓ $x \geq 5$	(3)
			[8]

QUESTION 11

11.1	$V = \pi r^2 h$ $225 = \pi r^2 h$ $h = \frac{225}{\pi r^2}$	A✓ $225 = \pi r^2 h$ A✓ $h = \frac{225}{\pi r^2}$	(2)
11.2	$SA = 2\pi r^2 + 2\pi rh$ $= 2\pi r^2 + 2\pi r \left(\frac{225}{\pi r^2} \right)$ $= 2\pi r^2 + \frac{450}{r}$	A✓ $SA = 2\pi r^2 + 2\pi rh$ A✓ $2\pi r^2 + 2\pi r \left(\frac{225}{\pi r^2} \right)$	(2)

11.3	$SA = 2\pi r^2 + 450r^{-1}$ $SA'(x) = 4\pi r - \frac{450}{r^2} = 0$ $4\pi r = \frac{450}{r^2}$ $r^3 = \frac{450}{4\pi}$ $r = \sqrt[3]{\frac{450}{4\pi}}$ $r = 3,30$	$A\checkmark SA'(x) = 4\pi r - \frac{450}{r^2}$ $A\checkmark \text{equating to } 0$ $A\checkmark \quad r = 3,30$	(3)
			[7]