



**education**

**MPUMALANGA PROVINCE  
REPUBLIC OF SOUTH AFRICA**

**NATIONAL  
SENIOR CERTIFICATE**

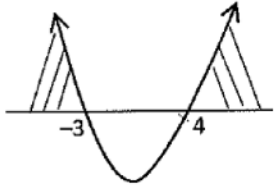

**GRADE 12**

**MATHEMATICS P1  
JUNE 2023  
MARKING GUIDELINES**

**This marking guideline consists of 12 pages.**



QUESTION 1

1.1.1	$(x-2)(-x+4) = 0$ $x-2=0$ or $-x+4=0$ $x=2$ or $x=4$	$\checkmark x=2$ $\checkmark x=4$	(2)
1.1.2	$3x^2 = 2x + 4$ $3x^2 - 2x - 4 = 0$ $x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(3)(-4)}}{2(3)}$ $x = \frac{2 \pm \sqrt{52}}{6}$ $x = -0,87$ or $x = 1,54$	$\checkmark$ standard form  $\checkmark$ substitution in correct  $\checkmark \checkmark$ values of $x$	(4)
1.1.3	$x - 2\sqrt{x-1} = 4$ $-2\sqrt{x-1} = 4 - x$ $(-2\sqrt{x-1})^2 = (4-x)^2$ $4x - 4 = 16 - 8x + x^2$ $x^2 - 12x + 20 = 0$ $(x-10)(x-2) = 0$ $x = 10$ or $x \neq 2$	$\checkmark$ isolate the surd $\checkmark$ square both sides  $\checkmark$ standard form $\checkmark$ factors $\checkmark$ $x$ -values $\checkmark x=10$ only	(6)
1.1.4	$x^2 - x - 12 > 0$ $(x-4)(x+3) > 0$   <p style="text-align: center;"><b>OR</b></p>  $x < -3$ or $x > 4$	$\checkmark$ standard f $\checkmark$ factors  $\checkmark$ critical values  $\checkmark$ solution	(4)

1.2	$x + 2y = 1$ $x = 1 - 2y$ $(1 - 2y)^2 - y(1 - 2y) - 5y^2 = -5$ $1 - 4y + 4y^2 - y + 2y^2 - 5y^2 = -5$ $y^2 - 5y + 6 = 0$ $(y - 3)(y - 2) = 0$  $y = 3 \text{ or } y = 2$ $x = 1 - 2(3) \text{ or } x = 1 - 2(2)$ $x = -5 \text{ or } x = -3$	✓ subject of formulae  ✓ substitution  ✓ standard form   ✓ factors   ✓ $y = 3 \text{ or } y = 2$   ✓ $x = -5 \text{ or } x = -3$	(6)
1.3	$5^x > 0$ $\therefore 2 - t > 0$ $\therefore t < 2$	✓ condition ✓ $2 - t > 0$ ✓ $t < 2$	(3)
			[25]

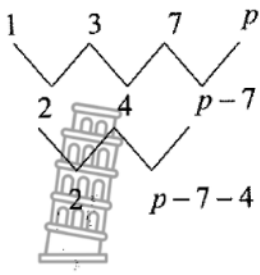



**QUESTION 2**

2.1	18	✓ answer	(1)
2.2	$T_n = 5n - 2$ $T_{253} = 5(253) - 2$ $T_{253} = 1263$	✓ nth term ✓ substitution ✓ answer	(3)
2.3	$\sum_{n=1}^{253} (5n - 2)$	✓ limits ✓ $5n - 2$	(2)
2.4	$S_{253} = \frac{253}{2} [3 + 1263]$ $S_{253} = 160149$  <b>OR</b> $S_{253} = \frac{253}{2} [2(3) + (253 - 1)5]$ $S_{253} = 160149$	✓ substitution ✓ answer  ✓ substitution ✓ answer	(2)
2.5	$8 + 28 + 48 + \dots + 1248$ $a = 8, d = 20$ $T_n = 20n - 12$ $20n - 12 = 1248$ $n = 63$	✓ terms divisible by 4  ✓ general term  ✓ equating ✓ value of $n$ .	(4)
			<b>[12]</b>



QUESTION 3

3.1.1	 <p> <math>p - 7 - 4 = 2</math>  <math>p = 13</math> </p>	<p>✓ first differences</p> <p>✓ equating ✓ <math>p = 13</math></p>	(3)		
3.1.2	$2a = 2$ $a = 1$	$3a + b = 2$ $3(1) + b = 2$ $b = -1$	$a + b + c = 1$ $1 - 1 + c = 1$ $c = 1$	<p>✓ <math>a = 1</math> ✓ <math>b = -1</math> ✓ <math>c = 1</math> ✓ <math>T_n = n^2 - n + 1</math></p>	(4)
3.1.3	$2, 4, 6 \dots$ $a = 2 \quad d = 2$ $T_n = 2n$ $2n = 62$ $n = 31$ Term number 31 and term number 32		<p>✓ general term ✓ equating</p> <p>✓ both 31 and 32</p>	(3)	
3.2	$\sum_{k=-2}^m 2.2^{k+2} < 2046$ $2.2^0 + 2.2^1 + 2.2^2 + 2.2^3 + \dots + 2.2^{m+2} < 2046$ $2 + 4 + 8 + 16 + \dots +$ $a = 2, \quad r = 2, \quad n = m - (-2) + 1$ $\quad \quad \quad = m + 3$ $\therefore \frac{2(2^{m+3} - 1)}{2 - 1} < 2046$ $2^{m+3} - 1 < 1023$ $2^{m+3} < 1024$ $2^{m+3} < 2^{10}$ $m + 3 < 10$ $m < 7$ $\therefore m = 6$	<p>✓ expansion</p> <p>✓ <math>a, r</math> and <math>n</math></p> <p>✓ substitution into correct formulae</p> <p>✓ <math>m &lt; 7</math> ✓ <math>m = 6</math></p> 	(5)		
			[15]		

QUESTION 4

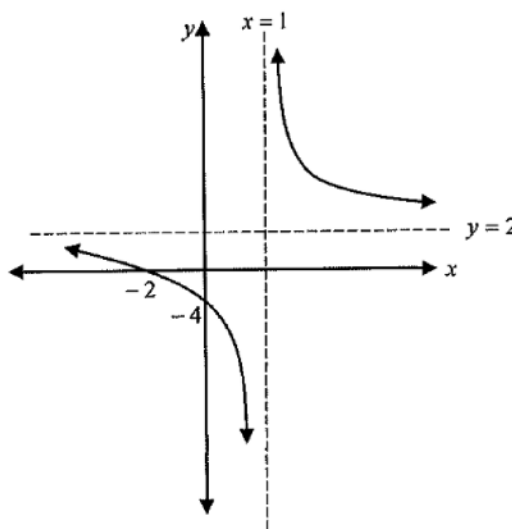
4.1.1	$\frac{-2+x}{2} = 1$ $x = 4$ $B(4;0)$ <div style="border: 1px solid black; padding: 2px; display: inline-block;">Answer only full marks</div>	✓ method ✓ $x = 4$	(2)
4.1.2	$y = 1(x - (-2))(x - 4)$ $y = x^2 - 2x - 8$	✓ method ✓ correct equation	(2)
4.1.3	$C(0; -8)$ $a = \frac{-8 - 0}{0 - 4}$ $a = \frac{8}{4} = 2$ $g(x) = 2x - 8$ $a = 2$ $q = -8$	✓ $C(0; -8)$ ✓ substitution ✓ $a = 2$ ✓ $q = -8$	(4)
4.1.4	$y = (1)^2 - 2(1) - 8$ $y = -9$ $(1; -9)$	✓ value of $y$ ✓ $(1; -9)$	(2)
4.2	$\frac{0+x}{2} = 1$ $x = 2$ $M(2; -8)$	✓ $x = 2$ ✓ $M(2; -8)$	(2)
4.3	$x < 0 \text{ or } x > 4$	✓ $x < 0$ ✓ $x > 4$	(2)
4.4	$(3; 9)$	✓ $x = 3$ ✓ $y = 9$	(2)
4.5	$TP = 2x - 8 - (x^2 - 2x - 8)$ $TP = -x^2 + 4x$ $TP' = -2x + 4$ $-2x + 4 = 0$ $x = 2$ $TP = -(2)^2 + 4(2)$ $TP = 4$	✓ top function –bottom function ✓ derivative ✓ equating to 0 ✓ answer	

OR			
Completing the square		✓ factoring a negative	
$-(x^2 - 4x)$		✓ completing the square	
$= -[(x-2)^2 - 4]$		✓✓ maximum 4 when	
$= -(x-2)^2 + 4$		$x = 2$	(4)
There is a maximum of 4 when $x = 2$			
			[20]

### QUESTION 5


5.1	$x > 0$ OR $x \in (0; \infty)$	✓ domain	(1)
5.2	$y = -\log_3 x$ $y = \log_3 x^{-1}$ $x = \log_3 y^{-1}$ $3^x = y^{-1}$ $y = \left(\frac{1}{3}\right)^x$ or $y = 3^{-x}$	✓ interchanging $x$ and $y$  ✓ correct equation	(2)
5.3	$f$ is shifted 5 units vertically down	✓ 5 units ✓ down	(2)
5.4	$\log_3 x = 3$ $x = 3^3$ $x = 27$ $\therefore -\log_3 x \geq -3$ $0 < x \leq 27$	✓ $x = 27$ ✓ $-\log_3 x \geq -3$ ✓✓ $0 < x \leq 27$	(4)
			[9]

QUESTION 6

6.1	$q = 2$	✓ answer	(1)
6.2	$y = x + p + 2$ $\therefore p + 2 = 1$ $p = -1$ $\therefore y = \frac{a}{x-1} + 2$ OR $-4 = \frac{a}{0-1} + 2$ $a = 6$	$y = x + 1$ $2 = x + 1$ $x = 1$  $\checkmark p + 2$ $\checkmark p = -1$  $\checkmark \text{sub } (0; -4)$  $\checkmark a = 6$	(4)
6.3	$y = \frac{6}{x-1} + 2$ $0 = \frac{6}{x-1} + 2$ $x = -2$ $(-2; 0)$	  $\checkmark x = -2$  $\checkmark x \text{ intercept}$ $\checkmark y \text{ intercept}$ $\checkmark \text{asymptote}$ $\checkmark \text{shape of graph}$	(5)
			[10]



QUESTION 7

7.1	$1 + i_{\text{eff}} = \left(1 + \frac{0,104}{12}\right)^{12}$ $i_{\text{eff}} = 1,109103376 - 1$ $i_{\text{eff}} = 10,91\%$ 	$\checkmark n = 12$ $\checkmark i = \frac{0,104}{12}$ $\checkmark$ substitution into the correct formula $\checkmark 10,91\%$	(4)
7.2	$0,5P = P(1 - i)^4$ $0,5 = (1 - i)^4$ $\sqrt[4]{0,5} = 1 - i$ $i = 1 - \sqrt[4]{0,5}$ $i = 0,1591$ $i = 15,91\%$	$\checkmark$ subs in correct formula $\checkmark$ divide by $P$ $\checkmark 4^{\text{th}}$ root $\checkmark i = 15,91\%$	(4)
7.3.1	Loan with interest to date $= 80000(1 + 0,21)^5$ $= R20\,7499,40$	$\checkmark$ subs in correct formula $\checkmark R20\,7499,40$	(2)
7.3.2	Repayments with interest to date $= 25000(1 + 0,21)^3 + 55000(1 + 0,21)^1$ $= R101673,20$ Outstanding balance = Loan with interest to date - Repayments with interest to date $= R207499,40 - R10\,673,20$ $= R105826,20$	$\checkmark 25000(1 + 0,21)^3$ $\checkmark 55000(1 + 0,21)^1$ $\checkmark R101673,20$ $\checkmark$ method $\checkmark 105826,20$	(5)
			[15]



QUESTION 8

8.1	$f(x+h) = 4(x+h) - 2(x+h)^2$ $= 4x + 4h - 2x^2 - 4xh - 2h^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{4x + 4h - 2x^2 - 4xh - 2h^2 - (4x - 2x^2)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{4h - 4xh - 2h^2}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{h(4 - 4x - 2h)}{h}$ $f'(x) = 4 - 4x$	$\checkmark f(x+h)$  $\checkmark$ subst. into correct formula $\checkmark 4h - 4xh - 2h^2$  $\checkmark$ factoring $h$ $\checkmark$ answer	(5)
8.2.1	$D_x[x^4 - x^{-2}]$ $= 4x^3 + 2x^{-1}$	$\checkmark x^{-2}$ $\checkmark 4x^3 \quad \checkmark 2x^{-1}$	(3)
8.2.2	$\sqrt{y} = \frac{x^2}{x} - \frac{4x}{x}$ $\sqrt{y} = x - 4$ $y = (x - 4)^2$ $y = x^2 - 8x + 16$ $\frac{dy}{dx} = 2x - 8$	$\checkmark$ dividing by $x$  $\checkmark$ squaring  $\checkmark \checkmark$ answer	(4)
8.3	$m = 36$ $f'(x) = 3x^2 - 12x$ $3x^2 - 12x = 36$ $3x^2 - 12x - 36 = 0$ $(x - 6)(x + 2) = 0$ $x \neq 6 \text{ or } x = -2$ $f(-2) = (-2)^3 - 6(-2)^2$ $f(-2) = -32$ $y - (-32) = 36(x - (-2))$ $y = 36x + 40$	$\checkmark f'(x) = 36$  $\checkmark$ factors $\checkmark x = -2$  $\checkmark y = -32$  $\checkmark$ equation	(5)
			[17]

QUESTION 9

9.1	C (2 ; 0)	✓ answer	(1)
9.2	$0 = a(-1)^3 + c(-1) + 2$ $a + c = 2$ $c = 2 - a$ $0 = a(2)^3 + c(2) + 2$ $c + 4a = -1$ $2 - a + 4a = -1$ $3a = -3$ $a = -1$ $c = 2 - (-1)$ $c = 3$	✓ substitute (-1 ; 0) ✓ subject of formula  ✓ substitute (2 ; 0)  ✓ sub in second equation	(4)
9.3	$f'(x) = -3x^2 + 3$ $0 = -3x^2 + 3$ $0 = -3(x-1)(x+1)$ $x = 1$ $f(1) = -(1)^3 + 3(1) + 2$ $= 4$ B(1 ; 4)	✓ equating derivative to zero ✓ x-value  ✓ y-value	(3)
9.4	$\frac{-1+1}{2} = 0$ OR $f'(x) = -3x^2 + 3$ $f''(x) = -6x$ $-6x = 0$ $x = 0$	✓ method   ✓ answer	(2)
9.5	$k < 0$ or $k > 4$	✓ $k < 0$ ✓ $k > 4$	(2)
9.6	$x < -1$ or $x > 1$	✓ both critical values ✓ $x < -1$ or $x > 1$	(2)
			[14]

QUESTION 10

10.1.1	$P(B) = 0,1 + 0,4$ $= 0,5$ $P(A) \times P(B) = 0,1$ $(x + 0,1)(0,5) = 0,1$ $x = 0,1$ $y = 1 - 0,1$ $y = 0,9$	$\checkmark P(B) = 0,5$ $\checkmark P(A) \times P(B) = 0,1$ $\checkmark x = 0,1$ $\checkmark y = 0,9$	(4)
10.1.2	$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ $= 0,2 + 0,5 - 0,1$ $= 0,6$	$\checkmark$ formulae $\checkmark P(A) = 0,2$ $\checkmark$ answer	(3)
10.2.1		$\checkmark 0,1 \times 0,95$ $\checkmark 0,1 \times 0,05$ $\checkmark$ non violent	(3)
10.2.2	$P(\text{Violent crime rep}) \text{ or } P(\text{Non -violent crime rep})$ $= 0,1 \times 0,95 + 0,9 \times 0,45$ $= 0,5$	$\checkmark 0,1 \times 0,95$ $\checkmark 0,9 \times 0,45$ $\checkmark$ answer	(3)
			[13]

TOTAL MARKS: 150