



education

MPUMALANGA PROVINCE  
REPUBLIC OF SOUTH AFRICA

**NATIONAL  
SENIOR CERTIFICATE**

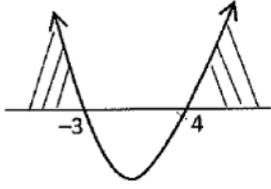
**GRADE 12**

**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)

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

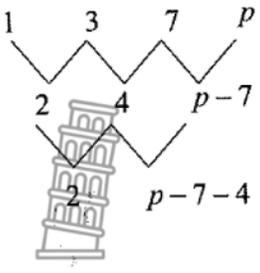


**QUESTION 2**

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	$S_{253} = \frac{253}{2} [3 + 1263]$ $S_{253} = 160149$ <p style="text-align: center;"><b>OR</b></p> $S_{253} = \frac{253}{2} [2(3) + (253 - 1)5]$ $S_{253} = 160149$	✓ 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**

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

**QUESTION 4**

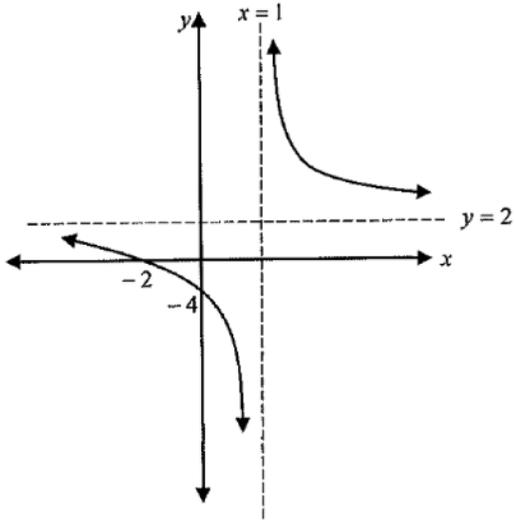
4.1.1	$\frac{-2+x}{2} = 1$ $x = 4$ B(4;0) <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 20px;">Answer only full marks</div>	✓ method ✓ $x = 4$	(2)
4.1.2	$y = 1(x - (-2))(x - 4)$ $y = x^2 - 2x - 8$	✓ method ✓ correct equation	(2)
4.1.3	C(0; -8) $a = \frac{-8 - 0}{0 - 4}$ $a = \frac{8}{4} = 2$ $g(x) = 2x - 8$ $a = 2$ $q = -8$	✓ 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	$x < 0$ 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	

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

**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 $y = 3^{-x}$	<p>✓ interchanging <math>x</math> and <math>y</math></p> <p>✓ correct equation</p>	(2)
5.3	$f$ is shifted 5 units vertically down	<p>✓ 5 units</p> <p>✓ down</p>	(2)
5.4	$\log_3 x = 3$ $x = 3^3$ $x = 27$ $\therefore -\log_3 x \geq -3$ $0 < x \leq 27$	<p>✓ <math>x = 27</math></p> <p>✓ <math>-\log_3 x \geq -3</math></p> <p>✓✓ <math>0 &lt; x \leq 27</math></p>	(4)
			<p>[9]</p>

**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 $-4 = \frac{a}{0-1} + 2$ $a = 6$	$\checkmark p + 2$ $\checkmark p = -1$ $\checkmark \text{sub } (0; -4)$ $\checkmark a = 6$	(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)
			<b>[10]</b>



QUESTION 7

7.1	$1 + i_{eff} = \left(1 + \frac{0.104}{12}\right)^{12}$ $i_{eff} = 1,109103376 - 1$ $i_{eff} = 10,91\%$ 	$\checkmark n = 12$ $\checkmark i = \frac{0,104}{12}$ $\checkmark$ 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)
			<b>[15]</b>



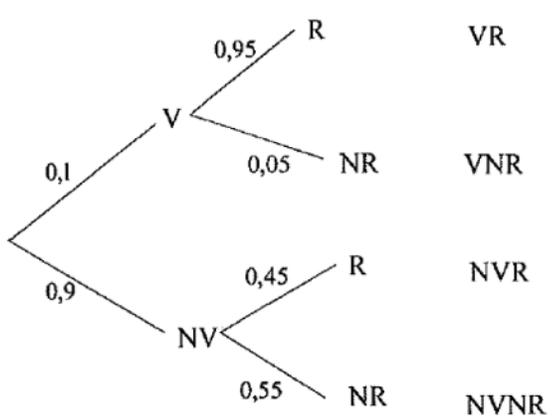
**QUESTION 8**

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

**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)
			<b>[13]</b>

**TOTAL MARKS: 150**