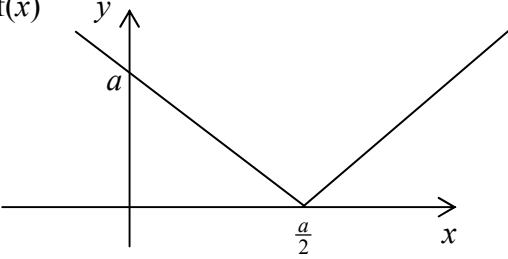
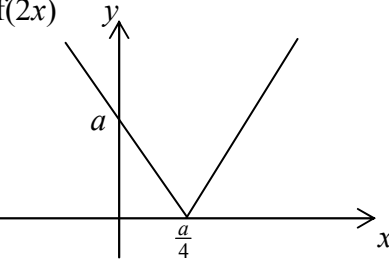
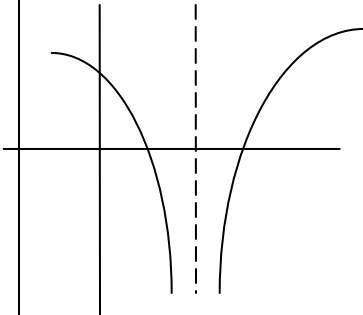


Question Number	Scheme	Marks
1.	$\frac{(x-3)(x-5)}{(x-3)(x+3)} \times \frac{2x(x+3)}{(x-5)^2}$ $= \frac{2x}{x-5}$ <p style="text-align: right;">(3 × factorising)</p>	<p>B1 B1 B1</p> <p>B1</p> <p><b>(4 marks)</b></p>
2. (a)	<p><math>f(x) = x + \ln 2x - 4; \quad x_{n+1} = 4 - \ln 2x_n, \quad x_0 = 2.4</math></p> <p><math>x_1 = 2.431\dots</math>                      A single sound application of iteration</p> <p><math>x_2 = 2.418\dots</math>                      At least <math>x_3</math> reached</p> <p><math>x_3 = 2.423\dots</math></p> <p>Root = 2.422 (A2)</p> <p>2.42 or “correct” unrounded to 3 d.p. answer A1</p>	<p>M1</p> <p>M1</p> <p>A2, 1, 0 (4)</p>
2. (b)	<p>Choosing an appropriate interval e.g. [2.4215, 2.4225]</p> <p>Establishing change of sign + Conclusion</p>	<p>M1</p> <p>A1 (2)</p> <p><b>(6 marks)</b></p>
3. (a)	<p><math>y = f(x)</math></p>  <p>Fairly even <math>\checkmark</math>, vertex on +ve <math>x</math> axis</p> <p>Only <math>(\frac{a}{2}, 0)</math> and <math>(0, a)</math> on graph on in text</p>	<p>B1</p> <p>B1 (2)</p>
3. (b)	<p><math>y = f(2x)</math></p>  <p>Steeper, even <math>\checkmark</math> and 1 correct intersection</p> <p>Only both <math>(\frac{a}{4}, 0)</math> and <math>(0, a)</math> on graph or in text</p>	<p>B1</p> <p>[ft <math>\frac{a}{2}</math> from (a)]</p> <p>B1 (2)</p>
3. (c)	<p><math>-(2x - a) = \frac{1}{2}x</math>      when <math>x = 4, \Rightarrow a - 8 = 2 \quad \therefore a = 10</math></p> <p><math>2x - a = \frac{1}{2}x</math>      when <math>x = 4, \Rightarrow 8 - a = 2 \quad \therefore a = 6</math></p>	<p>M1, A1</p> <p>M1, A1 (4)</p> <p><b>(8 marks)</b></p>

Question Number	Scheme	Marks
4.	$\frac{1 - \tan^2 \theta}{1 + \tan^2 \theta} = \frac{1 - \frac{\sin^2 \theta}{\cos^2 \theta}}{1 + \frac{\sin^2 \theta}{\cos^2 \theta}} \left( \begin{array}{l} 1 - \frac{\sin^2 \theta}{\cos^2 \theta} \\ \text{or } \frac{1 - \cos^2 \theta}{\sec^2 \theta} \text{ or equivalent} \end{array} \right)$ $\frac{\cos^2 \theta - \sin^2 \theta}{\cos^2 \theta + \sin^2 \theta} = \frac{\cos 2\theta}{1} = \cos 2\theta \quad *$	<p>M1 M1</p> <p>M1 A1 (4)</p> <p><b>(4 marks)</b></p>
5.	$\frac{3}{x(x+2)} + \frac{x-4}{(x+2)(x-2)}$ $= \frac{3(x-2) + x(x-4)}{x(x+2)(x-2)}$ $= \frac{(x-3)(x+2)}{x(x+2)(x-2)}$	<p>B1 B1</p> <p>M1 A1</p> <p>M1 A1 A1</p> <p><b>(7 marks)</b></p>
6.	<p>(a) <math>f'(x) = 2x - 2x - 3</math></p> $= 8 - \frac{6}{24} = 7\frac{31}{32} \text{ (7.97)}$ <p>(b) <math>f(x) = \frac{1}{3}x^3 - 2x - \frac{1}{x} \text{ (+C)}</math></p> $0 = 9 - 6 - \frac{1}{3} + C \quad C = -\frac{8}{3} \quad \text{(or } -2.67)$ <p>(c) <math>f(x) &gt; 0</math> needed, or <math>f(x) \geq 0</math>, or “as <math>x</math> increases, <math>f(x)</math> increases”</p> $f(x) = \left(x - \frac{1}{x}\right)^2, > 0 \text{ always, or } \geq 0 \text{ always}$	<p>M1 A1</p> <p>A1 (3)</p> <p>M1 A1</p> <p>M1 A1 (4)</p> <p>B1</p> <p>M1, A1 (3)</p> <p><b>(10 marks)</b></p>

Question Number	Scheme	Marks
7. (a)	$f(x) = \frac{2(2x+1)-6}{(x-1)(2x+1)}, = \frac{4x-4}{(x-1)(2x-1)}$ <p style="text-align: right;">(M for attempt same denominator)</p>	M1, A1
	<p>i.e</p> $f(x) = \frac{4(x-1)}{(x-1)(2x-1)}, = \frac{4}{(2x+1)}$ <p style="text-align: right;">(M for factorising)</p>	M1, A1 c.s.o (4)
(b)	$0 < f < \frac{4}{3} \quad \text{or} \quad 0 < y < \frac{4}{3}$	B1 Both B1 (2)
(c)	$y = \frac{4}{2x+1} \quad \Rightarrow y(2x+1) = 4$	M1
	<p>i.e <math>x = \frac{4-y}{2y}</math></p>	M1
	<p><math>\therefore f^{-1}(x) = \frac{4-x}{2x}</math> (o.e)</p> <p style="text-align: right;">must be <math>f^{-1}(x)</math></p>	A1 (3)
(d)	<p>Range of <math>f^{-1} = \text{domain of } f \therefore f^{-1} &gt; 1 \text{ or } y &gt; 1 \text{ or } &gt; 1</math></p>	B1 (1) <b>(10 marks)</b>

Question Number	Scheme
<p>8.</p> <p>(a)</p> <p>(b)</p> <p>(c)</p> <p>(d)</p> <p>(e)</p>	<p><math>y = \ln(3x - 6) \Rightarrow 3x - 6 = e^y</math></p> <p><math>\Rightarrow x = \frac{e^y + 6}{3}; \quad \{f^{-1}(x)\} = \frac{e^x + 6}{3}</math></p> <p>Domain: <math>x \in \mathfrak{R}</math></p> <p>Range: <math>f^{-1}(x) &gt; 2</math></p> <p>Attempting to find <math>f^{-1}(3) [= \frac{e^3 + 6}{3}]; = 8.70</math></p> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>In curve passing through <math>y = 0</math></p> <p>Symmetry in <math>x = k, k &gt; 0</math></p> <p>All correct and asymptote at <math>x = 2</math> labelled</p> </div> </div> <p>Meets <math>y</math>-axis: <math>(x = 0), y = \ln 6</math></p> <p>Meets <math>x</math>-axis: <math>x = \frac{5}{3}, (0); \quad x = \frac{7}{3}, (0)</math></p>

[May be seen on g