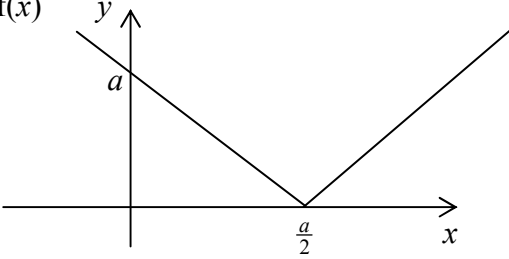
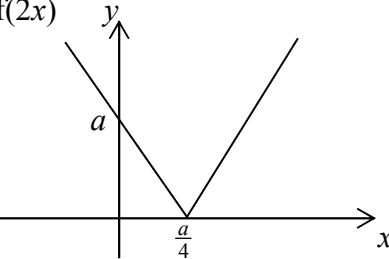
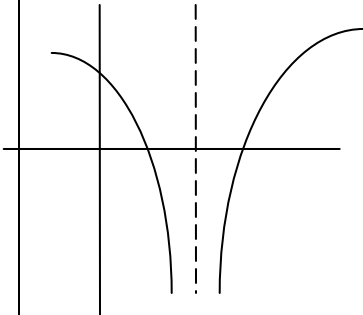


Question Number	Scheme	Marks
1.	$\frac{(x-3)(x-5)}{(x-3)(x+3)} \times \frac{2x(x+3)}{(x-5)^2}$ $= \frac{2x}{x-5}$ <p style="text-align: right;">(3 × factorising)</p>	<p>B1 B1 B1</p> <p>B1</p> <p>(4 marks)</p>
2. (a)	<p>$f(x) = x + \ln 2x - 4; \quad x_{n+1} = 4 - \ln 2x_n, \quad x_0 = 2.4$</p> <p>$x_1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

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

Question Number	Scheme	Marks
7. (a)	$f(x) = \frac{2(2x+1)-6}{(x-1)(2x+1)}, = \frac{4x-4}{(x-1)(2x-1)}$	M1, A1
	i.e $f(x) = \frac{4(x-1)}{(x-1)(2x-1)}, = \frac{4}{(2x+1)}$ *	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
	i.e $x = \frac{4-y}{2y}$	M1
	$\therefore f^{-1}(x) = \frac{4-x}{2x} \text{ (o.e)}$	A1 (3) must be $f^{-1}(x)$
(d)	Range of f^{-1} = domain of $f \therefore f^{-1} > 1$ or $y > 1$ or > 1	B1 (1) (10 marks)

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

[May be seen on g