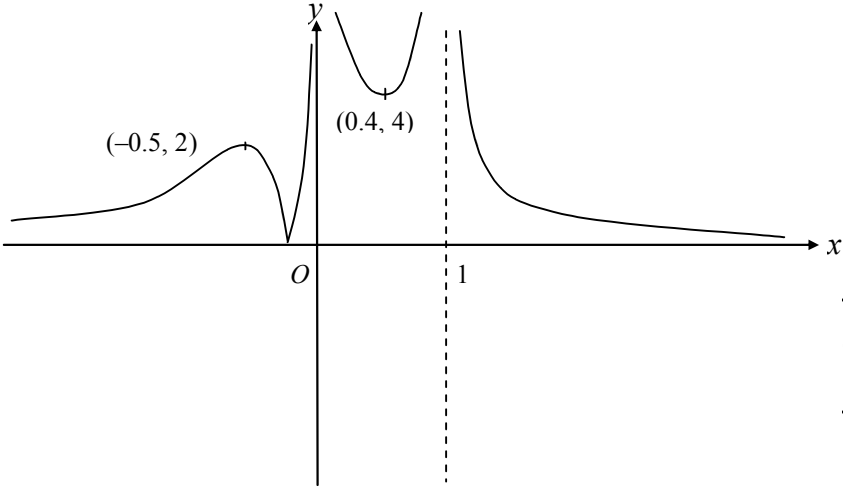
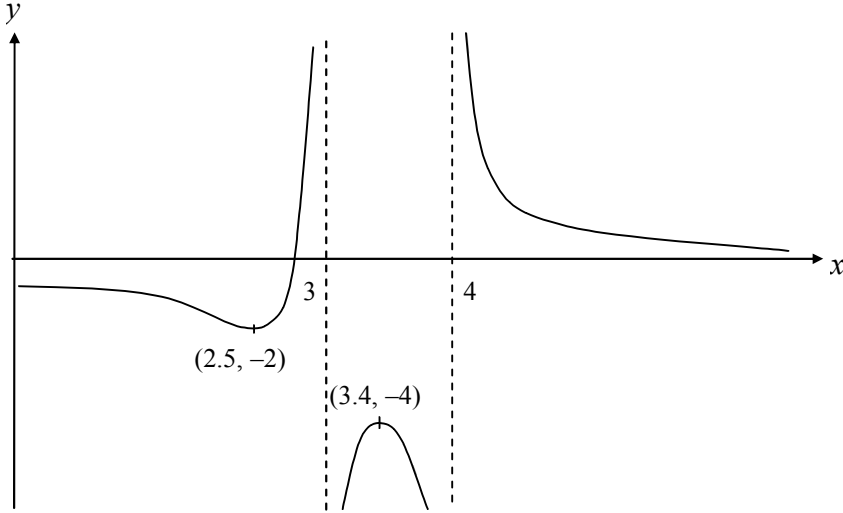
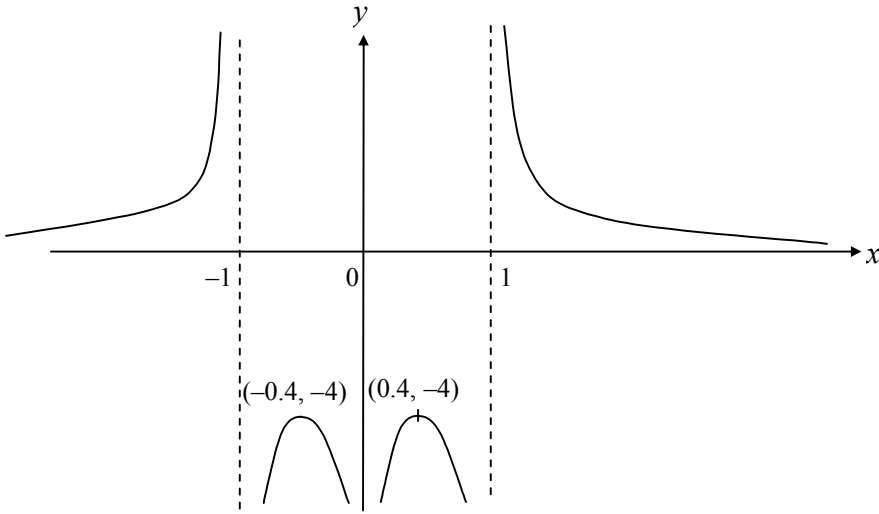
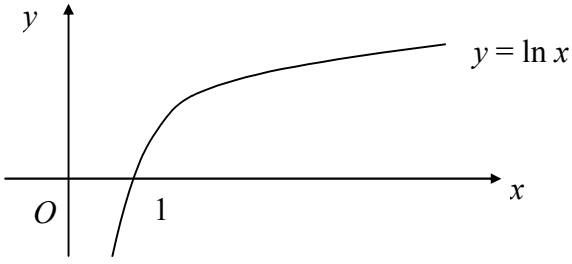
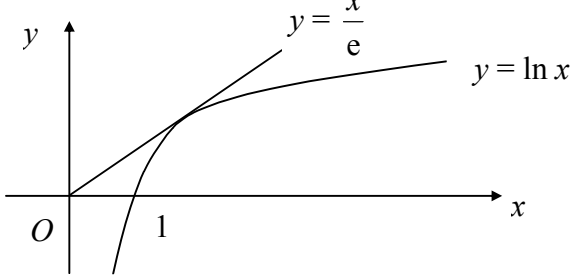


Question number	Scheme	Marks
1.	$2x^2 + 7x + 6 = (x + 2)(2x + 3)$ $\frac{3x^2}{(2+x)(3+2x)} \times \frac{7(3+2x)}{3x^5}$ $= \frac{7}{(2+x)x^3}$ <p style="text-align: right;">some correct algebraic cancelling</p>	M1 A1 M1 A1 (4) (4 marks)
2.	(a) $f^{-1}(x) = \frac{1}{2}x, \quad x \in \mathbb{R}$ (b) $gf^{-1}(x) = g(\frac{1}{2}x) = \frac{3}{4}x^2 + 2$ (c) Range $gf^{-1}(x) \geq 2$	B1 B1 (2) M1 A1 (2) B1 (1) (5 marks)
3.	(i) $e^{2x+3} = 6$ $2x + 3 = \ln 6$ $x = \frac{1}{2}(\ln 6 - 3)$ (ii) $\ln(3x + 2) = 4$ $3x + 2 = e^4$ $x = \frac{1}{3}(e^4 - 2)$	M1 M1 A1 (3) M1 M1 A1 (3) (6 marks)

Question number	Scheme	Marks
4. (i)	$u = x^3 \quad \frac{du}{dx} = 3x^2$ $v = e^{3x} \quad \frac{dv}{dx} = 3e^{3x}$ $\frac{dy}{dx} = 3x^2 e^{3x} + x^3 3e^{3x} \text{ or equiv}$	M1 A1 A1 (3)
(ii)	$u = 2x \quad \frac{du}{dx} = 2$ $v = \cos x \quad \frac{dv}{dx} = -\sin x$ $\frac{dy}{dx} = \frac{2 \cos x + 2x \sin x}{\cos^2 x} \text{ or equiv}$	M1 A1 A1 (3)
(iii)	$u = \tan x \quad \frac{du}{dx} = \sec^2 x$ $y = u^2 \quad \frac{dy}{du} = 2u$ $\frac{dy}{dx} = 2u \sec^2 x$ $\frac{dy}{dx} = 2 \tan x \sec^2 x$	M1 A1 (2)
(iv)	$u = y^2 \quad \frac{du}{dy} = 2y$ $x = \cos u \quad \frac{dx}{du} = -\sin u$ $\frac{dx}{dy} = -2y \sin y^2$ $\frac{dy}{dx} = \frac{-1}{2y \sin y^2}$	M1 A1 M1 A1 (4) (12 marks)

Question number	Scheme	Marks
5. (a) (i)	$\sin(A+B) - \sin(A-B)$ $= \sin A \cos B + \sin B \cos A - \sin A \cos B + \sin B \cos A$ $= 2 \sin B \cos A \quad (*)$	M1 A1 cso (2)
(ii)	$\cos(A-B) - \cos(A+B)$ $= \cos A \cos B + \sin A \sin B - \cos A \cos B + \sin A \sin B$ $= 2 \sin A \sin B \quad (*)$	M1 A1 cso (2)
(b)	$\frac{\sin(A+B) - \sin(A-B)}{\cos(A-B) - \sin(A+B)} = \frac{2 \sin B \cos A}{2 \sin A \sin B}$ $= \frac{\cos A}{\sin A}$ $= \cot A \quad (*)$	M1 A1 A1 cso (3)
(c)	Let $A = 75^\circ$ and $B = 15^\circ$ $\frac{\sin 90^\circ - \sin 60^\circ}{\cos 60^\circ - \cos 90^\circ} = \cot 75^\circ$ $\cot 75^\circ = \frac{1 - \frac{\sqrt{3}}{2}}{\frac{1}{2} - 0} = 2 - \sqrt{3}$	B1 M1 M1 A1 (4) (11 marks)

Question number	Scheme	Marks
6. (a)	 <p style="text-align: right;"> $x < 0$ $0 < x < 1$ $x > 1$ </p>	<p>B1 shape B1 shape B1 shape B1 points (4)</p>
(b)		<p>M1 any translation M1 correct direction, translation B1 points B1 asymptotes (4)</p>
(c)		<p>B1 shape > 0 B1 shape < 0 B1 points B1 asymptotes (4) (12 marks)</p>

Question number	Scheme	Marks
7. (a)		B1 shape B1 x-intercept labelled (2)
7. (b)	$\frac{dy}{dx} = \frac{1}{x}$ so tangent line to $(e, 1)$ is $y = \frac{1}{e}x + C$ the line passes through $(e, 1)$ so $1 = e \frac{1}{e} + C$ and $C = 0$ The line passes through the origin.	M1 M1 A1 (3)
7. (c)		
7. (c)	All lines $y = mx$ passing through the origin and having a gradient > 0 lie above the x -axis. Those having a gradient $< \frac{1}{e}$ will lie below the line. $y = \frac{x}{e}$ so it cuts $y = \ln x$ between $x = 1$ and $x = e$.	B1 B1 (2)
7. (d)	$x_0 = 1.86$ $x_1 = e^{\frac{x_0}{3}} = 1.859$ $x_2 = 1.858$ $x_3 = 1.858$ $x_4 = 1.858$ $x_5 = 1.857$	M1 A1 A1 (3)
7. (e)	When $x = 1.8575$, $\ln x - \frac{1}{3}x = 0.000\ 064\ 8... > 0$ When $x = 1.8565$, $\ln x = -0.000\ 140... < 0$ Change of sign implies there is a root between.	M1 A1 A1 (3) (13 marks)

Question number	Scheme	Marks
8. (a)	$4 \sin \theta - 3 \cos \theta = R \sin \theta \cos \alpha - R \cos \theta \sin \alpha$ $\sin \theta$ terms give $4 = R \cos \alpha$ $\cos \theta$ terms give $3 = R \sin \alpha$ $\tan \alpha = 0.75$ $\alpha = 36.9^\circ$ $R^2 = 4^2 + 3^2 = 25 \Rightarrow R = 5$	M1 A1 M1 A1 (4)
(b)	$5 \sin (\theta - 36.9^\circ) = 3$ $\sin (\theta - 36.9^\circ) = 0.6$ $\theta - 36.9^\circ = 36.9^\circ, 143.1$ $\theta = 73.7^\circ, 180^\circ$	M1 A1 M1 awrt 74° A1 A1 (5)
(c)	Max value 5	B1 (1)
(d)	$\sin (\theta - 36.9^\circ) = 1$ $\theta - 36.9^\circ = 90^\circ$ $\theta = 90^\circ + 36.9^\circ = 126.9^\circ$	M1 A1 (2) (12 marks)

Question	Specification Section	AO1	AO2	AO3	AO4	AO5	Totals
Q1	1.1	2	2				4
Q2	1.2	3	2				5
Q3	3.1, 3.2	2	4				6
Q4	4.1, 4.2, 4.3	5	6			1	12
Q5	2.3	3	5		3		11
Q6	1.3, 1.4	7	5				12
Q7	3.2, 5.2	2	3	2	3	3	13
Q8	2.1, 2.3	2	2	3	2	3	12
	TOTAL	26	29	5	8	7	75