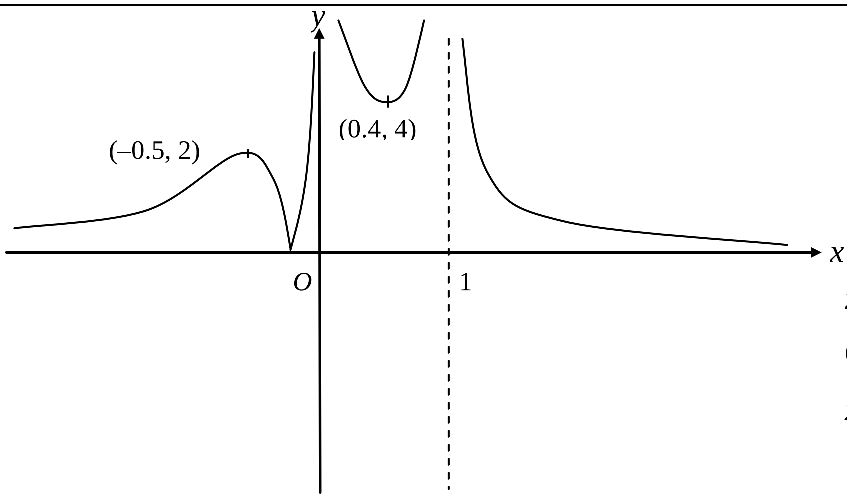
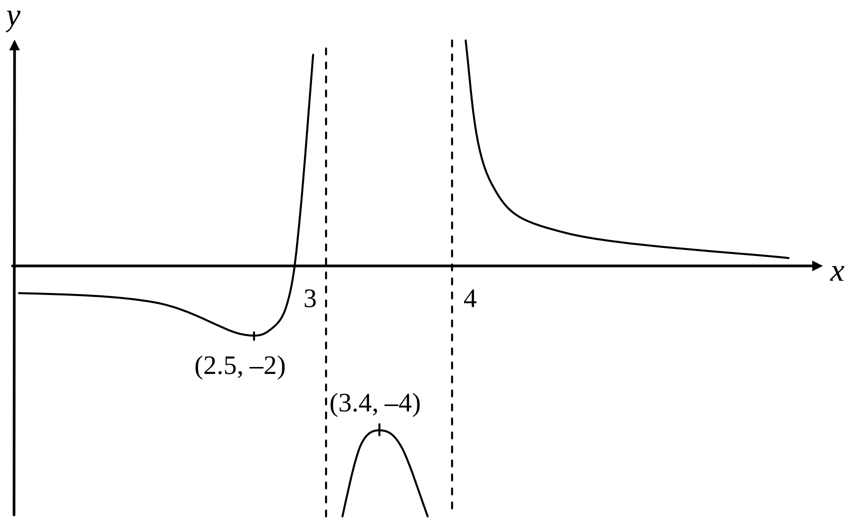
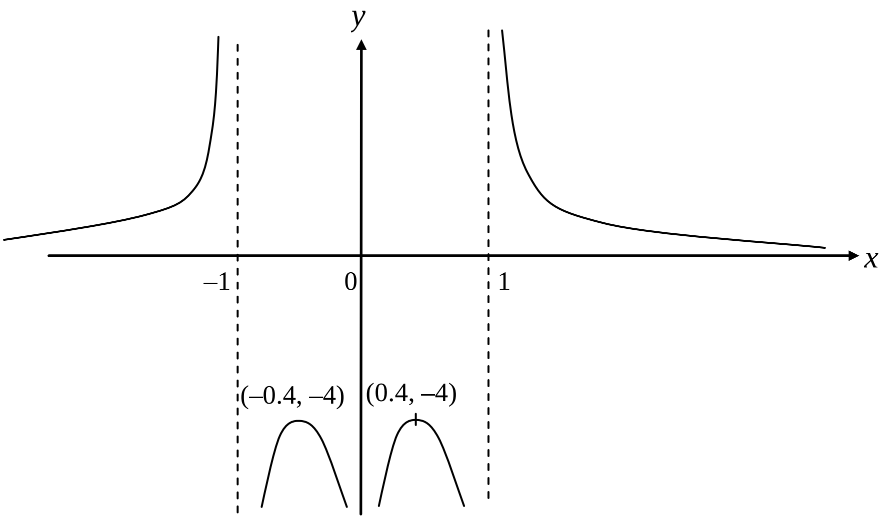
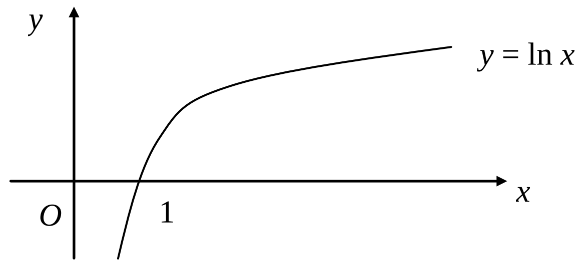
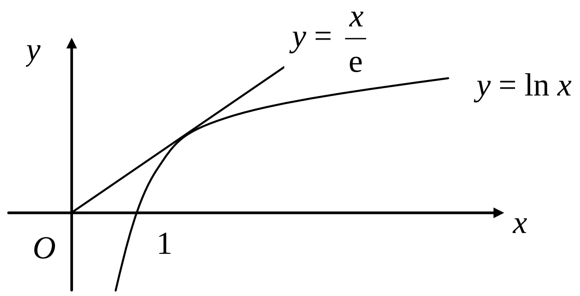
Question number		Scheme	Marks
1.		$2x^2 + 7x + 6 = (x + 2)(2x + 3)$	M1 A1
		$\dfrac{3x^2}{(2+x)(3+2x)} \times \dfrac{7(3+2x)}{3x^5}$	
		$= \dfrac{7}{(2+x)x^3}$ some correct algebraic cancelling	M1 A1 (4)
			(4 marks)
2.	(a)	$f^{-1}(x) = \frac{1}{2}x, \quad x \in \mathbb{R}$	B1 B1 (2)
	(b)	$gf^{-1}(x)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

Question number	Scheme	Marks
4. (i)	$u = x^3 \quad \frac{du}{dx} = 3x^2$	
	$v = e^{3x} \quad \frac{dv}{dx} = 3e^{3x}$	
	$\frac{dy}{dx} = 3x^2 e^{3x} + x^3 3e^{3x}$ or equiv	M1 A1 A1 (3)
(ii)	$u = 2x \quad \frac{du}{dx} = 2$	
	$v = \cos x \quad \frac{dv}{dx} = -\sin x$	
	$\frac{dy}{dx} = \frac{2\cos x + 2x\sin x}{\cos^2 x}$ or equiv	M1 A1 A1 (3)
(iii)	$u = \tan x \quad \frac{du}{dx} = \sec^2 x$	
	$y = u^2 \quad \frac{dy}{du} = 2u$	
	$\frac{dy}{dx} = 2u \sec^2 x$	M1
	$\frac{dy}{dx} = 2 \tan x \sec^2 x$	A1 (2)
(iv)	$u = y^2 \quad \frac{du}{dy} = 2y$	
	$x = \cos u \quad \frac{dx}{du} = -\sin u$	M1
	$\frac{dx}{dy} = -2y \sin y^2$	A1
	$\frac{dy}{dx} = \frac{-1}{2y \sin y^2}$	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*	M1	
	= 2 sin *B* cos *A* (*)	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*	M1	
	= 2 sin *A* sin *B* (*)	A1 cso	(2)
(b)	$\frac{\sin(A+B)-\sin(A-B)}{\cos(A-B)-\sin(A+B)} = \frac{2\sin B\cos A}{2\sin A\sin B}$	M1	
	$= \frac{\cos A}{\sin A}$	A1	
	= cot *A* (*)	A1 cso	(3)
(c)	Let *A* = 75° and *B* = 15°	B1	
	$\frac{\sin 90^\circ - \sin 60^\circ}{\cos 60^\circ - \cos 90^\circ} = \cot 75^\circ$	M1	
	$\cot 75^\circ = \frac{1-\frac{\sqrt{3}}{2}}{\frac{1}{2}-0} = 2-\sqrt{3}$	M1 A1	(4)
			(11 marks)

Question number	Scheme	Marks
6. (a)		
	$x < 0$	B1 shape
	$0 < x < 1$	B1 shape
	$x > 1$	B1 shape
		B1 points (4)
(b)		M1 any translation M1 correct direction, translation B1 points B1 asymptotes (4)
(c)		B1 shape > 0 B1 shape < 0 B1 points B1 asymptotes (4)
		(12 marks)

Question number	Scheme	Marks
7. (a)		B1 shape B1 x-intercept labelled (2)
(b)	$\frac{dy}{dx} = \frac{1}{x}$ so tangent line to (e, 1) is $y = \frac{1}{e}x + C$	M1
	the line passes through (e, 1) so $1 = e\frac{1}{e} + C$ and $C = 0$	M1
	The line passes through the origin.	A1 (3)
		
(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.	B1
	$y = \frac{x}{e}$ so it cuts $y = \ln x$ between $x = 1$ and $x = e$.	B1 (2)
(d)	$x_0 = 1.86$	
	$x_1 = e^{\frac{x_n}{3}} = 1.859$	M1
	$x_2 = 1.858$	A1
	$x_3 = 1.858$	
	$x_4 = 1.858$	
	$x_5 = 1.857$	A1 (3)
(e)	When $x = 1.8575$, $\ln x - \frac{1}{3}x = 0.000\,064\,8\ldots > 0$	M1
	When $x = 1.8565$, $\ln x = -0.000\,140\ldots < 0$	A1
	Change of sign implies there is a root between.	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 $3 = R\sin\alpha$			
		$\tan\alpha = 0.75$		M1	
		$\alpha = 36.9^{\circ}$		A1	
		$R^2 = 4^2 + 3^2 = 25 \Rightarrow R = 5$		M1 A1	(4)
	(b)	$5\sin(\theta - 36.9^{\circ}) = 3$			
		$\sin(\theta - 36.9^{\circ}) = 0.6$		M1	
		$\theta - 36.9^{\circ} = 36.9^{\circ}$, 143.1		A1 M1	
		$\theta = 73.7^{\circ}$, $180°$	awrt 74°	A1 A1	(5)
	(c)	Max value 5		B1	(1)
	(d)	$\sin(\theta - 36.9^{\circ}) = 1$		M1	
		$\theta - 36.9° = 90°$			
		$\theta = 90° + 36.9^{\circ} = 126.9^{\circ}$		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**