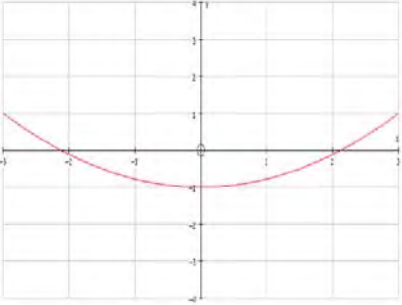
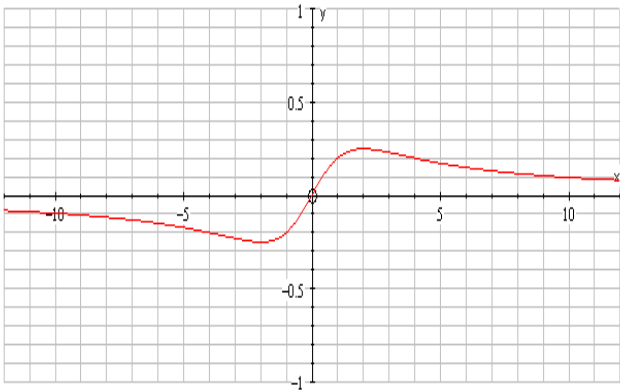


Question Number	Scheme	Marks
1.	<p>(a) $\frac{3(x+1)}{(x+2)(x-1)} \equiv \frac{A}{x+2} + \frac{B}{x-1}$, and correct method for finding A or B</p> <p>$A = 1, B = 2$</p> <p>(b) $f'(x) = -\frac{1}{(x+2)^2} - \frac{2}{(x-1)^2}$</p> <p>Argument for negative, including statement that square terms are positive for all values of x. (f.t. on wrong values of A and B)</p>	<p>M1</p> <p>A1 A1 (3)</p> <p>M1 A1</p> <p>A1 ft (3)</p> <p>(6 marks)</p>
2.	<p>(a) Attempt to use correctly stated double angle formula $\cos 2t = 2\cos^2 t - 1$, or complete method using other double angle formula for $\cos 2t$ with $\cos^2 t + \sin^2 t = 1$ to eliminate t and obtain $y =$</p> <p>$y = 2\left(\frac{x}{3}\right)^2 - 1$ or any correct equivalent (even $y = \cos 2\left(\cos^{-1}\left(\frac{x}{3}\right)\right)$)</p> <p>(b)</p> 	<p>M1</p> <p>A1 (2)</p> <p>shape B1</p> <p>position including restricted domain $-3 < x < 3$ B1 (2)</p> <p>(4 marks)</p>
3.	$\int \frac{\cos \theta}{\cos^3 \theta} d\theta, = \int \sec^2 \theta d\theta$ $= \tan \theta (+c)$ $= \frac{\sin \theta}{\cos \theta} (+c) = \frac{x}{\sqrt{1-x^2}} (+c) (*)$	<p>M1 A1, M1</p> <p>B1</p> <p>M1 A1</p> <p>(6 marks)</p>
4.	<p>Estimate for $M^2 = \frac{0.25}{2} [(48^2 + 29^2) + 2(207^2 + 37^2 + 161^2)]$</p> <p>Evaluating this estimate to 17 900 (awrt)</p> <p>$M \approx 134$ (133.9), (130)</p>	<p>M1 B1 M1</p> <p>M1 A1</p> <p>A1</p> <p>(6 marks)</p>

Question Number	Scheme	Marks
5.	$\text{Volume} = \pi \int_1^4 \left(1 + \frac{1}{2\sqrt{x}}\right)^2 dx$ $\int \left(1 + \frac{1}{2\sqrt{x}}\right)^2 dx = \int \left(1 + \frac{1}{\sqrt{x}} + \frac{1}{4x}\right) dx$ $= \left[x + 2\sqrt{x} + \frac{1}{4} \ln x \right]$ <p>Using limits correctly</p> $\text{Volume} = \pi \left[\left(8 + \frac{1}{4} \ln 4\right) + 3 \right]$ $= \pi \left[5 + \frac{1}{2} \ln 2 \right]$	<p>M1</p> <p>B1</p> <p>M1 A1 A1ft</p> <p>M1</p> <p>A1</p> <p>A1</p> <p>(8 marks)</p>
6.	<p>(a) $\frac{dV}{dt} = 30 - \frac{2}{15}V$</p> <p>$\Rightarrow -15 \frac{dV}{dt} = -450 + 2V$, (*) no wrong working seen</p> <p>(b) Separating the variables $\Rightarrow -\frac{15}{2V-450} dV = dt$</p> <p>Integrating to obtain $-\frac{15}{2} \ln 2V-450 = t$ OR $-\frac{15}{2} \ln V-225 = t$</p> <p>Using limits correctly or finding c ($-\frac{15}{2} \ln 1550$ OR $-\frac{15}{2} \ln 775$)</p> <p>$\ln \frac{2V-450}{1550} = -\frac{2}{15}t$, or equivalent</p> <p>Rearranging to give $V = 225 + 775e^{-\frac{2}{15}t}$.</p> <p>(c) $V = 225$</p>	<p>M1 A1</p> <p>A1 (3)</p> <p>M1</p> <p>M1 A1</p> <p>M1</p> <p>A1</p> <p>M1A1 (7)</p> <p>B1 (1)</p> <p>(11 marks)</p>

Question Number	Scheme	Marks
<p>7.</p> <p>(a)</p> <p>(b)</p> <p>(c)</p>	<p>$\frac{dy}{dx} = \frac{(4+x^2)-x(2x)}{(4+x^2)^2}$ or (from product rule) $(4+x^2)^{-1} - 2x^2(4+x^2)^{-2}$</p> <p>Solve $\frac{dy}{dx} = 0$ to obtain $(2, \frac{1}{4})$, and $(-2, -\frac{1}{4})$ [(2 and -2) only = A1]</p> <p>When $x = 2$, $\frac{d^2y}{dx^2} = -0.0625 < 0$, thus maximum</p> <p>When $x = -2$, $\frac{d^2y}{dx^2} = 0.0625 > 0$, thus minimum</p>  <p>Shape for $-2 \leq x \leq 2$</p> <p>Shape for $x > 2$</p> <p>Shape for $x < -2$</p>	<p>M1 A1</p> <p>M1 A1 A1 (5)</p> <p>B1 M1</p> <p>B1 (3)</p> <p>B1</p> <p>B1</p> <p>B1 (3)</p> <p>(11 marks)</p>
<p>8.</p> <p>(i)</p> <p>(ii) (a)</p> <p>(b)</p> <p>(c)</p>	<p>$\cos x \cos 30 - \sin x \sin 30 = 3(\cos x \cos 30 + \sin x \sin 30)$ Use of $\cos(x \pm 30)$</p> <p>$\Rightarrow \sqrt{3} \cos x - \sin x = 3\sqrt{3} \cos x + 3 \sin x$ Sub. for sin 30 etc decimals M1, surds A1</p> <p>i.e. $-4 \sin x = 2\sqrt{3} \cos x \rightarrow \tan x = -\frac{\sqrt{3}}{2}$ (*) Use $\tan x = \frac{\sin x}{\cos x}$</p> <p>LHS = $\frac{1 - (1 - 2 \sin^2 \theta)}{2 \sin \theta \cos \theta}$ Use of $\cos 2A$ or $\sin 2A$; both correct</p> <p>$= \frac{\sin \theta}{\cos \theta} = \tan \theta$ (*)</p> <p>Verifying: $0 = 2 - 2$ (since $\sin 360 = 0$, $\cos 360 = 1$)</p> <p>Equation $\rightarrow 1 = \frac{2(1 - \cos 2\theta)}{\sin 2\theta}$ Rearrange to form $\frac{1 - \cos 2\theta}{\sin 2\theta}$</p> <p>$\Rightarrow \tan \theta = \frac{1}{2}$</p> <p>i.e. $\theta = 26.6^\circ$ or 206.6° (Accept 27°, 207°)</p>	<p>M1</p> <p>M1, A1</p> <p>M1, A1cso (5)</p> <p>M1; A1</p> <p>A1 cso (3)</p> <p>B1 cso (1)</p> <p>M1</p> <p>A1</p> <p>M1 A1 (4)</p> <p>(13 marks)</p>

Question Number	Scheme	Marks
9.	<p>(a) Any two of $1 + \lambda = -2 + 2\mu$ $3 + 2\lambda = 3 + \mu$ $5 - \lambda = -4 + 4\mu$</p> <p>Solve simultaneous equations to obtain $\mu = 2$, or $\lambda = 1$</p> <p>Lines intersect at (2, 5, 4)</p> <p>Check in the third equation or on second line</p> <p>(b) $1 \times 2 + 2 \times 1 + (-1) \times 4 = 0$ line perpendicular</p> <p>(c) P is the point (3, 7, 3) [i.e. $\lambda = 2$] and R is the point (4, 6, 8) [i.e. $\mu = 3$]</p> <p>$PQ = \sqrt{1^2 + 2^2 + (-1)^2} = \sqrt{6}$</p> <p>$RQ = \sqrt{2^2 + 1^2 + 4^2} = \sqrt{21}$</p> <p>$PR = \sqrt{27}$</p> <p>The area of the triangle = $\frac{1}{2} \times \sqrt{6} \times \sqrt{21} = \frac{3\sqrt{14}}{2}$</p>	<p>M1</p> <p>M1 A1</p> <p>M1 A1</p> <p>B1 (6)</p> <p>M1 A1 (2)</p> <p>M1 A1</p> <p>M1 A1 ft</p> <p>M1 A1 (6)</p> <p>(14 marks)</p>