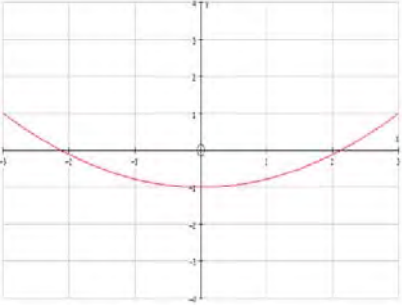
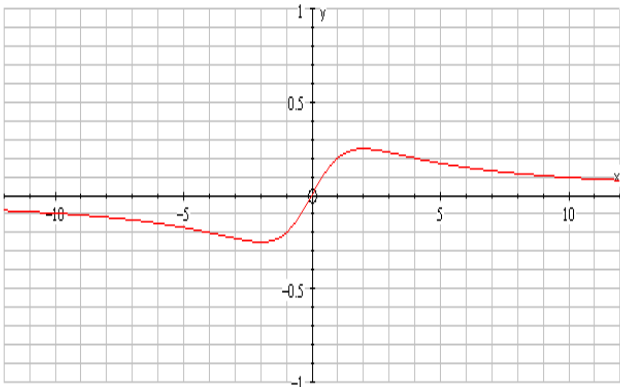


Question Number	Scheme	Marks
<p>1. (a)</p> <p>(b)</p>	$\frac{3(x+1)}{(x+2)(x-1)} \equiv \frac{A}{x+2} + \frac{B}{x-1}$ , and correct method for finding $A$ or $B$ $A = 1, B = 2$ $f'(x) = -\frac{1}{(x+2)^2} - \frac{2}{(x-1)^2}$ Argument for negative, including statement that square terms are positive for all values of $x$ . (f.t. on wrong values of $A$ and $B$ )	<p>M1</p> <p>A1 A1 (3)</p> <p>M1 A1</p> <p>A1 ft (3)</p> <p><b>(6 marks)</b></p>
<p>2. (a)</p> <p>(b)</p>	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 $y =$ $y = 2(\frac{x}{3})^2 - 1$ or any correct equivalent (even $y = \cos 2(\cos^{-1}(\frac{x}{3}))$ ) 	<p>M1</p> <p>A1 (2)</p> <p>shape B1</p> <p>position including restricted domain <math>-3 &lt; x &lt; 3</math> B1 (2)</p> <p><b>(4 marks)</b></p>
<p>3.</p>	$\int \frac{\cos \theta}{\cos^3 \theta} d\theta, = \int \sec^2 \theta d\theta$ $= \tan \theta (+c)$ $= \frac{\sin \theta}{\cos \theta} (+c) = \frac{x}{\sqrt{1-x^2}} (+c) (*)$	<p>M1 A1, M1</p> <p>B1</p> <p>M1 A1</p> <p><b>(6 marks)</b></p>
<p>4.</p>	Estimate for $M^2 = \frac{0.25}{2} [(48^2 + 29^2) + 2(207^2 + 37^2 + 161^2)]$ Evaluating this estimate to 17 900 (awrt) $M \approx 134$ (133.9), (130)	<p>M1 B1 M1</p> <p>M1 A1</p> <p>A1</p> <p><b>(6 marks)</b></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><b>(8 marks)</b></p>
6.	<p>(a) <math>\frac{dV}{dt} = 30 - \frac{2}{15}V</math></p> <p><math>\Rightarrow -15 \frac{dV}{dt} = -450 + 2V</math>, (*) no wrong working seen</p> <p>(b) Separating the variables <math>\Rightarrow -\frac{15}{2V - 450} dV = dt</math></p> <p>Integrating to obtain <math>-\frac{15}{2} \ln 2V - 450  = t</math> OR <math>-\frac{15}{2} \ln V - 225  = t</math></p> <p>Using limits correctly or finding <math>c</math> (<math>-\frac{15}{2} \ln 1550</math> OR <math>-\frac{15}{2} \ln 775</math>)</p> <p><math>\ln \frac{2V - 450}{1550} = -\frac{2}{15}t</math>, or equivalent</p> <p>Rearranging to give <math>V = 225 + 775e^{-\frac{2}{15}t}</math>.</p> <p>(c) <math>V = 225</math></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><b>(11 marks)</b></p>

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

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