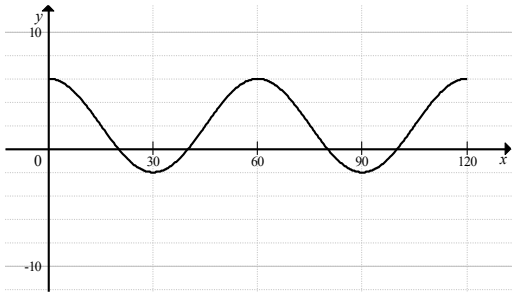
Question	Answer	Marks	Partial Marks
2(a)	Correct curve  	**3**	**B2** for correct cosine shape over 2 cycles with midline at $y = 2$ and consistent amplitude or **B1** for attempt at cosine shape over 2 cycles **with** consistent amplitude **B1** for a consistent amplitude of 2; must have attempted correct shape **Maximum of 2 marks if not fully correct**
2(b)	4	**1**	
2(c)	60°	**1**	
3(a)	$a = 2$, $b = 3$, $c = -2$	**2**	**B1** for any two correct
3(b)	$-3 \leqslant x \leqslant -0.5$ or $x \geqslant 1$	**3**	**B1** for the critical values –3, –0.5, 1 **B1** for $-3 \leqslant x \leqslant -0.5$ **B1** for $x \geqslant 1$
4(a)	$(2y-1)\log 5 = \log 6 + y\log 3$ oe or $2y\log 5 = \log 30 + y\log 3$ oe OR [rearranges $\frac{5^{2y}}{5} = 6\times 3^{y}$ and collects powers to a single power in y] $\left(\frac{5^2}{3}\right)^{y} = 30$ oe	**M1**	
	Collects terms and factorises: $y(2\log 5 - \log 3) = \log 6 + \log 5$ oe or $y(2\log 5 - \log 3) = \log 30$ oe OR takes logs $y = \log_{\frac{25}{3}} 30$ oe or $y\log\left(\frac{5^2}{3}\right) = \log 30$ oe	**M1**	**FT** if of equivalent difficulty
	1.604	**A1**	cao

Question	Answer	Marks	Partial Marks
4(b)	$e^{4x} - 4e^{2x} + 3 = 0$ or $(e^{2x})^2 - 4e^{2x} + 3 = 0$ oe	**M1**	condone one error
	Factorises: $(e^{2x} - 1)(e^{2x} - 3)$ oe or solves $e^{4x} - 4e^{2x} + 3 = 0$ oe	**M1**	**FT** $a(e^{2x})^2 + be^{2x} + c[= 0]$
	$e^{2x} = 1, \quad e^{2x} = 3$	**A1**	
	$x = 0$, $x = \frac{1}{2}\ln 3$ or exact equivalent	**A1**	
5	$\frac{dV}{dr} = 4\pi r^2$ **oe and** $\left.\frac{dV}{dr}\right\|_{r=6} = 144\pi$	**B1**	
	$\frac{dr}{dt} = \frac{dV}{dt} \times \frac{dr}{dV}$ **soi**	**B1**	Not if chain rule for $\frac{dt}{dr}$ unless answer is inverted
	$\frac{24}{\text{their } 144\pi}$	**M1**	*their* 144π must come from an attempt at differentiation
	0.0531 or 0.05305[16….] rot to 4 or more sig figs	**A1**	
6(a)	$3\begin{pmatrix} x-8 \\ y-5 \end{pmatrix} = 2\begin{pmatrix} x-4 \\ y-7 \end{pmatrix}$ oe OR $\overrightarrow{QR} = \begin{pmatrix} x-8 \\ y-5 \end{pmatrix}$ and $\overrightarrow{PR} = \begin{pmatrix} x-4 \\ y-7 \end{pmatrix}$ and $3x - 24 = 2x - 8$ and $3y - 15 = 2y - 14$	**M1**	
	$x = 16$	**A1**	**dep** on vector method
	$y = 1$	**A1**	**dep** on vector method