Question	Answer	Marks	Partial Marks
6(a)	$\tan 15° = \dfrac{\sqrt{3}-1}{\sqrt{3}+1}$	**M1**	Correct use of tan
	$\tan 15° = \dfrac{\left(\sqrt{3}-1\right)}{\left(\sqrt{3}+1\right)} \times \dfrac{\left(\sqrt{3}-1\right)}{\left(\sqrt{3}-1\right)}$	**M1**	Multiply by $\left(\sqrt{3}-1\right)$
	$\tan 15° = 2-\sqrt{3}$	**A1**	**AG** So all working must be seen
6(b)	$(BC)^2 = \left(\sqrt{3}-1\right)^2 + \left(\sqrt{3}+1\right)^2$	**M1**	Correct use of Pythagoras
	$BC = \sqrt{8}$ or $2\sqrt{2}$	**A1**	
7(a)	$\mathrm{p}\left(\dfrac{1}{2}\right) = 2\left(\dfrac{1}{8}\right) - 3\left(\dfrac{1}{4}\right) - 23\left(\dfrac{1}{2}\right) + 12 = 0$	**B1**	Working must be seen
7(b)	$\mathrm{p}(x) = (2x-1)\left(x^2 - x - 12\right)$	**2**	**M1** for terms x^2 and -12 **A1** for $-x$
	$\mathrm{p}(x) = (2x-1)(x-4)(x+3)$	**2**	**M1** for solving quadratic **A1** for all three correct factors
	$\mathrm{f}(x) = 0 \rightarrow x = \dfrac{1}{2}, 4, -3$	**A1**	
8(a)	$40 = A \times b^{10}$ and $45 = A \times b^{13}$	**B1**	
	$b^3 = \dfrac{45}{40}$	**M1**	Divide to find b^3.
	$b = 1.04$	**A1**	
	$A = 27$	**A1**	
8(b)	59	**B1**	$P = 27 \times 1.04^{20}$
8(c)	$100 = 27 \times 1.04^t$	**M1**	Insert $P = 100$ in their expression
	$t = \dfrac{\log\left(\dfrac{100}{27}\right)}{\log 1.04}$ oe	**M1**	Rearrange to make t the subject
	$t = 33.4 \rightarrow$ Year 2034	**A1**	
9(a)	$v = 2\mathrm{e}^{2t} - 10\mathrm{e}^t - 12$ $a = 4\mathrm{e}^{2t} - 10\mathrm{e}^t$	**3**	**M1** for correctly differentiating e^{2t}. **A1** for v correct **A1** for a correct

Question	Answer	Marks	Partial Marks
9(b)	$v = 0 \rightarrow e^{2t} - 5e^{t} - 6 = 0$ $\rightarrow \left(e^{t} + 1\right)\left(e^{t} - 6\right) = 0$	**M1**	Factorise quadratic Solve and discard $e^{t} = -1$
	$e^{t} = 6$	**A1**	
	$t = \ln 6 = 1.79$	**A1**	
9(c)	$t = \ln 6 \rightarrow a = 4 \times 36 - 10 \times 6 = 84$	**2**	**M1** for inserting *their* value of t into a
10(a)	$\frac{dy}{dx} = -\frac{(1+x)}{x} = -\left(\frac{1}{x} + 1\right)$	**2**	**M1** for using $m_1 \times m_2 = -1$
	$y = -\ln x - x + C$	**2**	**M1** for integrating $\frac{1}{x}$ **A1** for all correct including C
	$4 = -\ln 1 - 1 + C$ $C = 5 \rightarrow y = 5 - \ln x - x$	**A1**	Insert (1, 4) and arrive at correct answer. AG
10(b)	$x = 3 \rightarrow y = 2 - \ln 3$ and $\frac{dy}{dx} = -\frac{1}{3} - 1 = -\frac{4}{3}$	**B1**	
	$\frac{y - (2 - \ln 3)}{x - 3} = -\frac{4}{3}$	**M1**	
	$y = -\frac{4}{3}x + 6 - \ln 3$ or $y = -1.33x + 4.90$	**A1**	
11(a)	$\frac{dy}{dx} = x \times \frac{1}{2}\left(16 - x^2\right)^{-\frac{1}{2}} \times (-2x) + \left(16 - x^2\right)^{\frac{1}{2}}$	**3**	**B1** for $\frac{d}{dx}\left(16 - x^2\right)^{\frac{1}{2}}$ $= \frac{1}{2}\left(16 - x^2\right)^{-\frac{1}{2}} \times (-2x)$ **M1** for product rule **A1** for all correct
	$\frac{dy}{dx} = 0 \rightarrow \left(16 - x^2\right)^{\frac{1}{2}} = \frac{x^2}{\left(16 - x^2\right)^{\frac{1}{2}}}$ $x^2 = 8$ $\left(2\sqrt{2}, 8\right)$	**3**	**M1** for setting $\frac{dy}{dx} = 0$ and attempt to solve **M1** for obtaining $x^2 = k$ **A1**