Question	Answer	Marks	Partial Marks
5	$\log_a\left(\frac{5(p+1)p}{p+2}\right) = \log_a 12$ oe, nfww or $\frac{5(p+1)p}{p+2} = 12$ oe, nfww	**M2**	**M1** for correct use of one log law in a correct equation e.g. $\log_a(p+1)+\log_a p-\log_a(p+2)+\log_a 5=\log_a 12$ or $\log_a p(p+1)-\log_a(p+2)=\log_a 12-\log_a 5$ or $\log_a \frac{p+1}{p+2}+\frac{1}{\log_p a}+\log_a 5=\log_a 12$
	$5p^2 - 7p - 24 = 0$	**A1**	
	$(5p + 8)(p - 3) = 0$ or formula	**DM1**	**FT** *their* 3-term quadratic
	$p = 3$ and no other solution nfww	**A1**	
6(a)	*OA*: $2\sqrt{3}$ or $\sqrt{12}$ soi	**B1**	
	Correct method to find angle *AOE* e.g. $2\tan(\ldots) = \frac{3}{\sqrt{3}}$ oe or $36 = 12+12-2(12)\cos AOE$ oe or $\pi - 2\tan^{-1}\frac{\sqrt{3}}{3}$ oe	**M1**	
	Angle *AOE*: $\frac{2\pi}{3}$ soi, isw	**A1**	
	Arc *AFE*: *their* $2\sqrt{3}$ × *their* $\frac{2\pi}{3}$ soi or $\frac{4\sqrt{3}}{3}\pi$	**M1**	**FT** *their* $\frac{2\pi}{3}$ and *their* $2\sqrt{3}$
	Perimeter: $10 + 2\sqrt{3} + \frac{4\sqrt{3}}{3}\pi$ or exact equivalent, cao	**A1**	

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Question	Answer	Marks	Partial Marks
6(b)	Sum of three correct areas $4\pi + 12 + 3\sqrt{3}$ cao	**3**	**M2 FT** *their* $\frac{2\pi}{3}$ and *their* $2\sqrt{3}$ for sector *AOE*: $\frac{1}{2} \times (\textit{their}\ 2\sqrt{3})^2 \times \textit{their}\ \frac{2\pi}{3}$ oe or 4π **and** $\frac{1}{2} \times 6 \times 4$ or $2 \times \frac{1}{2} \times 3 \times \sqrt{3}$ oe or **M1 FT** *their* $\frac{2\pi}{3}$ and *their* $2\sqrt{3}$ for sector *AOE*: $\frac{1}{2} \times (\textit{their}\ 2\sqrt{3})^2 \times \textit{their}\ \frac{2\pi}{3}$ oe or 4π
7	Attempts product rule	**M1**	
	$\frac{dy}{dx} = 2\cos x - 2x\sin x$ oe	**A1**	
	When $x = \pi$, $\frac{dy}{dx} = -2$	**DM1**	**FT** *their* $\left.\frac{dy}{dx}\right\|_{x=\pi}$
	Gradient of normal: $\frac{1}{2}$	**M1**	**FT** $\frac{-1}{\textit{their}\left.\frac{dy}{dx}\right\|_{x=\pi}}$
	$y + 2\pi = \frac{1}{2}(x - \pi)$ oe	**A1**	**FT** *their* normal gradient
	$(5\pi, 0)$ or $(0, -\frac{5}{2}\pi)$ oe, soi	**A1**	
	Area of triangle *POQ*: $\frac{25}{4}\pi^2$ nfww	**A1**	
8(a)	$3t^2 + 2t - 1$	**B1**	
	$(3t - 1)(t + 1)$	**M1**	**FT** *their* 3-term quadratic in $t = 0$ soi
	$t = \frac{1}{3}$ and no other solutions	**A1**	
8(b)	At $t = 0$, $x = 8$ and $v = -1$	**B2**	**B1** for $t = 0$, $x = 8$ or $t = 0$, $v = -1$
	Conclusion: Since x is positive and v is negative [the particle is moving towards *O*.]	**B1**	

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