Question	Answer	Marks	Guidance
10(b)	$r = 2\cos\theta$	**B1**	
	$-\frac{1}{2} < \cos\theta < \frac{1}{2}$ $-1 < 2\cos\theta < 1$ $\lvert 2\cos\theta \rvert < 1$	**B1**	
	$-90^{\circ} < \theta < -60^{\circ}$	**B1**	
	$60^{\circ} < \theta < 90^{\circ}$	**B1**	
11	$4x + k\cos 3x$	**M1**	
	$4x - \frac{2}{3}\cos 3x$	**A1**	
	$\left(\frac{4\pi}{3} - k\cos\pi\right) - \left(\frac{4\pi}{18} - k\cos\frac{\pi}{6}\right)$	**M1**	**M1 dep** for correct application of limits
	Area under the curve $\frac{10\pi}{9} + \frac{2}{3} + \frac{\sqrt{3}}{3}$	**A2**	**A1** for one correct term
	When $x = \frac{\pi}{18}$, $y = 5$	**B1**	May be seen on the diagram
	When $x = \frac{\pi}{3}$, $y = 4$	**B1**	May be seen on the diagram
	Area of trapezium $= \frac{5\pi}{4}$	**B1**	For area of trapezium
	Shaded area = $\frac{2}{3} + \frac{\sqrt{3}}{3} - \frac{5\pi}{36}$	**A1**	

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Question	Answer	Marks	Guidance
12(a)	$2\left(\cot^2\theta+1\right)-5=5\cot\theta$ soi	**B1**	
	$2\cot^2\theta-5\cot\theta-3=0$	**M1**	For attempt to obtain a 3-term quadratic in terms of $\cot\theta$, equated to zero
	$\left(2\cot\theta+1\right)\left(\cot\theta-3\right)=0$	**M1**	**M1 dep** for attempt to factorise, or use of quadratic formula oe
	$\tan\theta=-2,\ \tan\theta=\frac{1}{3}$	**M1**	**M1 dep** for obtaining in terms of $\tan\theta$, using *their* factors
	$-161.6^o,\ -63.4^o,\ 18.4^o,\ 116.6^o$	**3**	**M1** for a correct solution **A1** for another correct solution **A1** for a further 2 correct solutions and no extras in the range
	Alternative		
	$2\left(\cot^2\theta+1\right)-5=5\cot\theta$ soi	**B1**	
	$2\cot^2\theta-5\cot\theta-3=0$	**M1**	For attempt to obtain a 3-term quadratic in terms of $\cot\theta$, equated to zero
	$3\tan^2\theta+5\tan\theta-2=0$	**M1**	**M1 dep** for attempt to obtain a 3-term quadratic in terms of $\tan\theta$, equated to zero
	$\left(3\tan\theta-1\right)\left(\tan\theta+2\right)=0$ $\tan\theta=-2,\ \tan\theta=\frac{1}{3}$	**M1**	**M1 dep** for attempt to factorise, or use of quadratic formula oe and obtaining $\tan\theta=...$
	$-161.6^o,\ -63.4^o,\ 18.4^o,\ 116.6^o$	**3**	**M1** for a correct solution **A1** for another correct solution **A1** for a further 2 correct solutions and no extras in the range
10(b)	$\sin\left(2\phi+1.5\right)=\frac{2}{3}$ $2\phi+1.5=0.7297...$ soi	**M1**	
	$2\phi+1.5=2.4119$ or 7.0129 or 8.6591	**A1**	
	0.456, 2.76, 3.6[0]	**3**	**M1** for correct order of operations **A1** for one correct solution **A1** for a further 2 correct solutions and no extras in the range.

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