## 5.3) Area enclosed by a polar curve

Worked example	Your turn
Find the area enclosed by the cardioid with equation $r = a(1 + \sin \theta)$	Find the area enclosed by the cardioid with equation $r = a(1 + \cos \theta)$
	$\frac{3a^2\pi}{2}$

Worked example	Your turn
Find the area of one loop of the curve with polar equation $y = a \cos 3\theta$	Find the area of one loop of the curve with polar equation $y = a \sin 4\theta$
	$\frac{a^2\pi}{16}$

Worked example	Your turn
A curve has equation $r = a + 3 \cos \theta$ , $a > 0$ The area enclosed by the curve is $\frac{107}{2}\pi$ . Find the value of $a$ .	A curve has equation $r = a + 5 \sin \theta$ , $a > 5$ The area enclosed by the curve is $\frac{187}{2}\pi$ . Find the value of $a$ . a = 9

Worked example	Your turn	
Find the exact value of the area of the finite region contained within both curves $r = 1 + \sin \theta$ and $r = 3 \sin \theta$ Find region $r = 1 + \sin \theta$ and $r = 3 \sin \theta$	d the exact value of the area of the finite gion contained within both two curves = $2 + \cos \theta$ and $r = 5 \cos \theta$ $\frac{43\pi}{12} - \sqrt{3}$	

Worked example	Your turn	
The set of points, A, is defined by: $A = \{z; \frac{\pi}{2} < \arg z < \pi\} \cap \{z;  z + 12 - 5i  < 13\}$	The set of points, A, is defined by: $A = \left\{ z: -\frac{\pi}{2} \le \arg z \le 0 \right\} \cap \left\{ z:  z - 4 + 3i  \le 5 \right\}$	
Find the area of the region defined by $A$	Find the area of the region defined by $A$	
	35.1 (3 st)	

Worked example		Your turn	
Two curves are given by the polar equations		Two curves are given by the polar equations	
r = 3,	$0 \le \theta < \frac{\pi}{2}$	r = 2,	$0 \le \theta < \frac{\pi}{2}$
$r = 2.5 + \sin 5\theta$	$0 \le \theta \le \frac{\overline{2}\pi}{r}$	$r = 1.5 + \sin 3\theta$	$0 \le \theta \le \frac{\overline{\pi}}{2}$
Find the area of the region enclosed between the two curves where $r > 2$ and $r < 1.5 + \sin 3\theta$		Find the area of the region enclosed between the two curves where $r > 2$ and $r < 1.5 + \sin 3\theta$	
		$13\sqrt{3}$	5π
			36