

Section 10.2 – Polar Coordinates  
Section 10.3 – Tangent Lines, Arc Length & Area for Polar Curves

Find the rectangular coordinates of the points whose polar coordinates are given.

3. a.  $(6, \pi/6)$     b.  $(7, 2\pi/3)$     c.  $(-6, -5\pi/6)$     d.  $(0, -\pi)$     e.  $(7, 17\pi/6)$     f.  $(-5, 0)$

6. In each part, find polar coordinates satisfying the stated conditions for the point whose rectangular coordinates are  $(-\sqrt{3}, 1)$

- a.  $r \geq 0$  and  $0 \leq \theta < 2\pi$
- b.  $r \leq 0$  and  $0 \leq \theta < 2\pi$
- c.  $r \geq 0$  and  $-2\pi \leq \theta < 0$
- d.  $r \leq 0$  and  $-2\pi \leq \theta < 0$

Find the slope of the tangent line to the polar curve for the given value of  $\theta$ .

- 1.  $r = 2 \sin \theta$ ;  $\theta = \frac{\pi}{6}$
- 5.  $r = \sin 3\theta$ ;  $\theta = \frac{\pi}{4}$

9. Find polar coordinates of all points at which the polar curve  $r = a(1 + \cos \theta)$  has a horizontal or vertical tangent line.

21. Calculate the arc length of the polar curve (cardioid)  $r = a(1 - \cos \theta)$

Find the area of the region described.

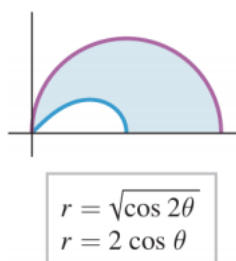
29. The region that is enclosed by the cardioid  $r = 2 + 2 \sin \theta$

31. The region enclosed by the rose  $r = 4 \cos 3\theta$

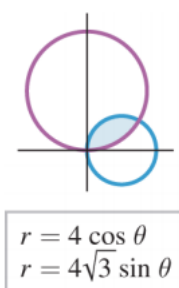
33. The region enclosed by the inner loop of the limaçon  $r = 1 + 2 \cos \theta$ . [Hint:  $r \leq 0$  over the interval of integration]

Find the area of the shaded region.

35.



37.



Find the area of the region described.

39. The region inside the circle  $r = 3 \sin \theta$  and outside the cardioid  $r = 1 + \sin \theta$ .

41. The region inside the cardioid  $r = 2 + 2 \cos \theta$  and outside the circle  $r = 3$ .

43. The region inside the loops of the limaçon  $r = \frac{1}{2} + \cos \theta$ .