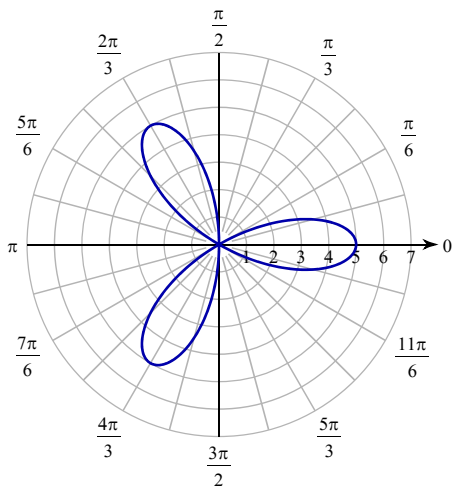


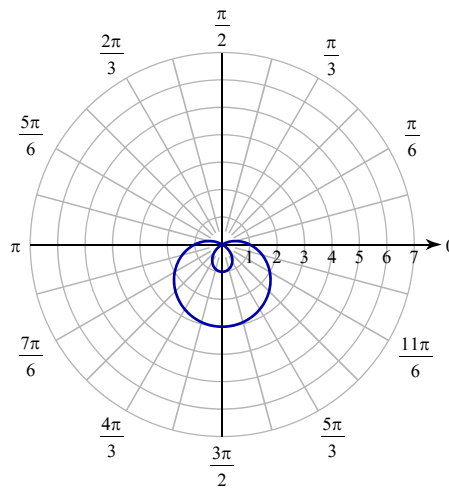
## Graphs of Polar Equations

Consider each polar graph. Classify the curve; and determine if the graph is symmetric with respect to the origin, polar axis, and line  $\theta = \pi/2$ .

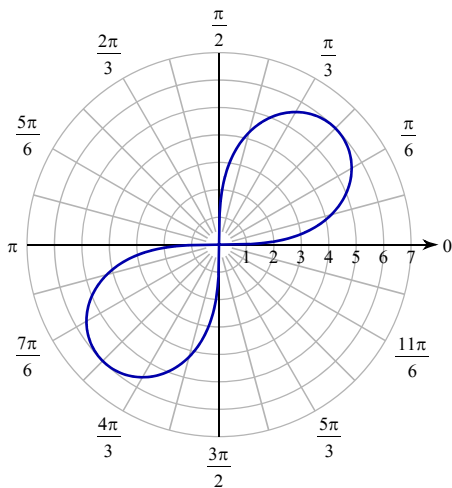
1)



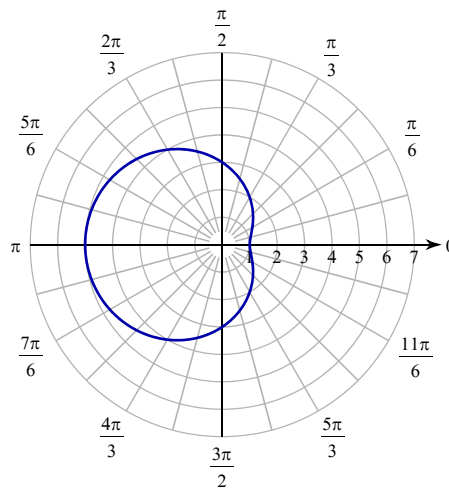
2)



3)

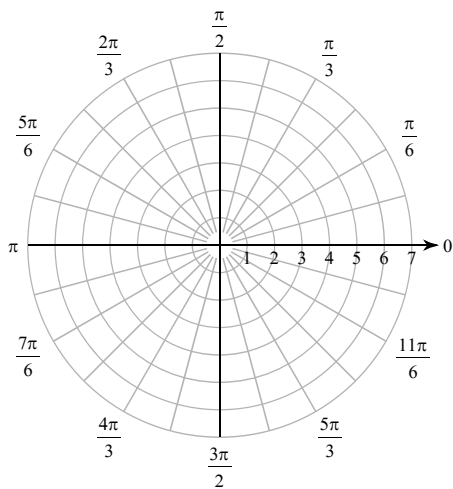


4)

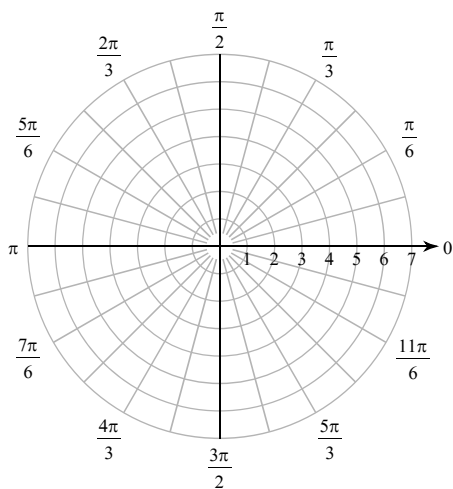


Consider each polar equation over the given interval. Classify the curve; determine if the graph is symmetric with respect to the origin, polar axis, and line  $\theta=\pi/2$ ; find the values of  $\theta$  where  $r$  is zero; find the maximum  $|r|$  value and the values of  $\theta$  where this occurs; and sketch the graph.

5)  $r = 6\sin(3\theta), 0 \leq \theta < \pi$



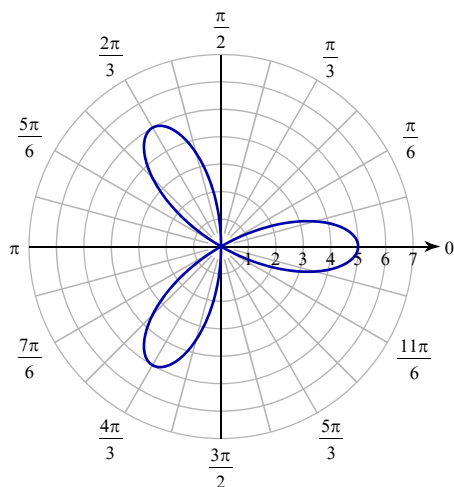
6)  $r^2 = 36\cos(2\theta), 0 \leq \theta < 2\pi$



## Graphs of Polar Equations

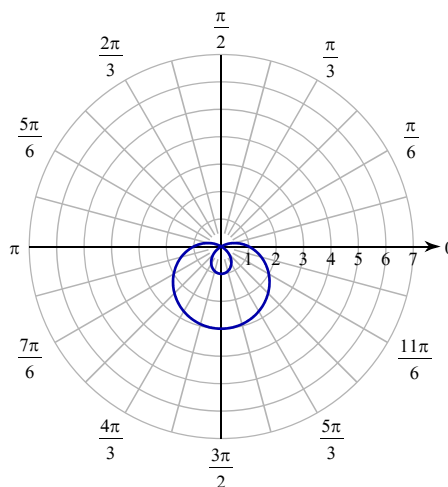
Consider each polar graph. Classify the curve; and determine if the graph is symmetric with respect to the origin, polar axis, and line  $\theta = \pi/2$ .

1)



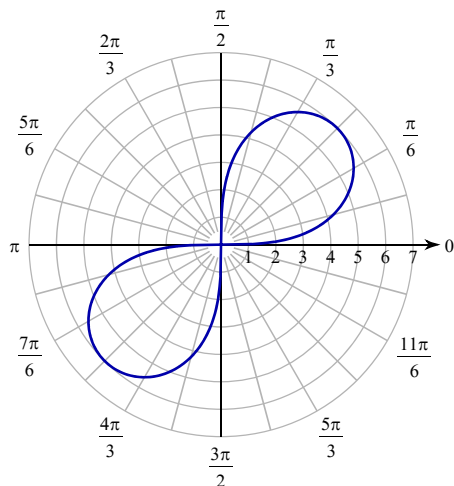
Rose  
Symmetric about the polar axis

2)



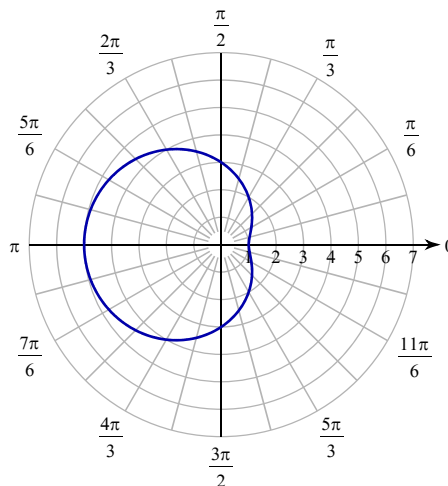
Looped limaçon  
Symmetric about the line  $\theta = \frac{\pi}{2}$

3)



Lemniscate  
Symmetric about the origin

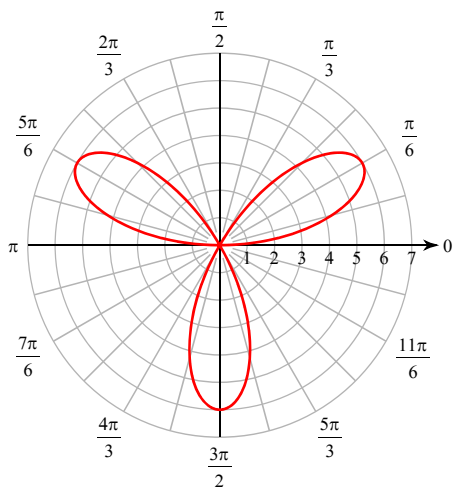
4)



Dimpled limaçon  
Symmetric about the polar axis

Consider each polar equation over the given interval. Classify the curve; determine if the graph is symmetric with respect to the origin, polar axis, and line  $\theta=\pi/2$ ; find the values of  $\theta$  where  $r$  is zero; find the maximum  $|r|$  value and the values of  $\theta$  where this occurs; and sketch the graph.

5)  $r = 6\sin(3\theta), 0 \leq \theta < \pi$



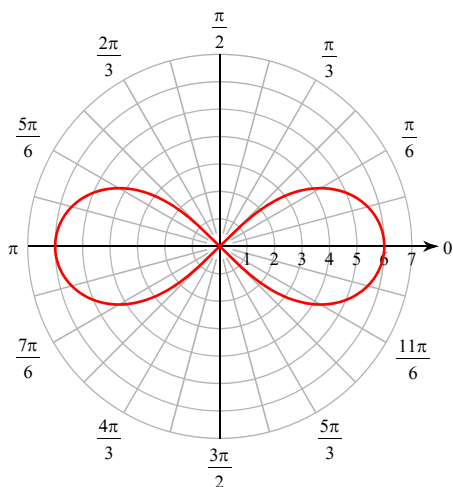
Rose

Symmetric about the line  $\theta = \frac{\pi}{2}$

$$r = 0 \text{ when } \theta = \left\{ 0, \frac{\pi}{3}, \frac{2\pi}{3} \right\}$$

$$|r| = 6 \text{ when } \theta = \left\{ \frac{\pi}{6}, \frac{\pi}{2}, \frac{5\pi}{6} \right\}$$

6)  $r^2 = 36\cos(2\theta), 0 \leq \theta < 2\pi$



Lemniscate

Symmetric about the the origin,  
polar axis, and line  $\theta = \frac{\pi}{2}$

$$r = 0 \text{ when } \theta = \left\{ \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4} \right\}$$

$$|r| = 6 \text{ when } \theta = \{0, \pi\}$$