Polar Review

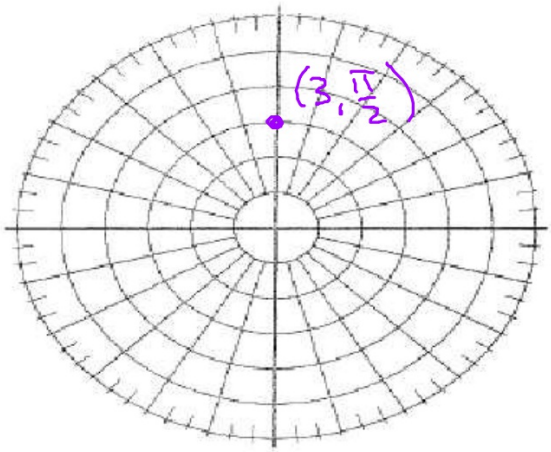
Plot the point whose polar coordinates are given. Then find the Cartesian coordinates of the point.

8) $\left(3, \frac{\pi}{2}\right)$

$x = r\cos\theta \qquad y = r\sin\theta$

$x = 3\cos\frac{\pi}{2} \qquad y = 3\sin\frac{\pi}{2}$

$x = 0 \qquad y = 3$



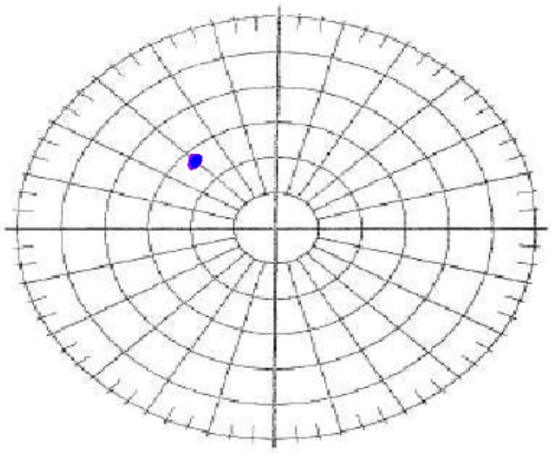
Plot the point whose polar coordinates are given. Then find the Cartesian coordinates of the point.

17) $\left(2\sqrt{2}, \frac{3\pi}{4}\right)$

$x = 2\sqrt{2}\cos\frac{3\pi}{4}$ $\quad y = 2\sqrt{2}\sin\frac{3\pi}{4}$

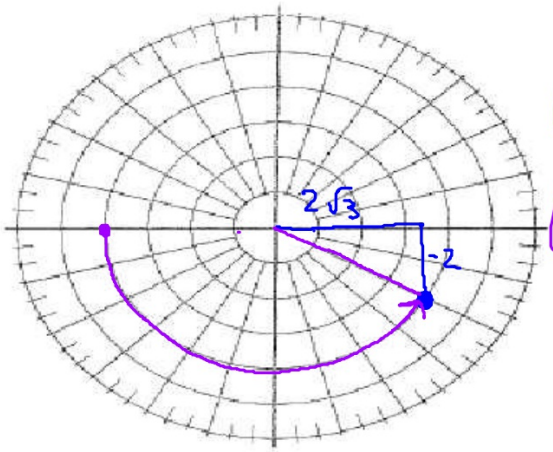
$x = 2\sqrt{2}\left(-\frac{\sqrt{2}}{2}\right)$ $\quad y = 2\sqrt{2}\left(\frac{\sqrt{2}}{2}\right)$

$x = -2$ $\quad y = 2$



The Cartesian coordinates of a point are given. Plot the point and then find 4 polar representations of the curve

9) $\left(2\sqrt{3},-2\right)$



$(4,-30^\circ)$

$(4,330^\circ)$

$(-4,150^\circ)$

$(-4,-210^\circ)$

$r=\sqrt{(2\sqrt{3})^2+(-2)^2}$

$r=\sqrt{(4\cdot3)+4}$

$r=\sqrt{16}=4$

$\theta=\tan^{-1}\left(\frac{-2}{2\sqrt{3}}\right)$

$\theta=\tan^{-1}\left(\frac{-1}{\sqrt{3}}\right)$

$\theta=\tan^{-1}\left(\frac{-1/2}{\sqrt{3}/2}\right)$

$\theta=-30^\circ$

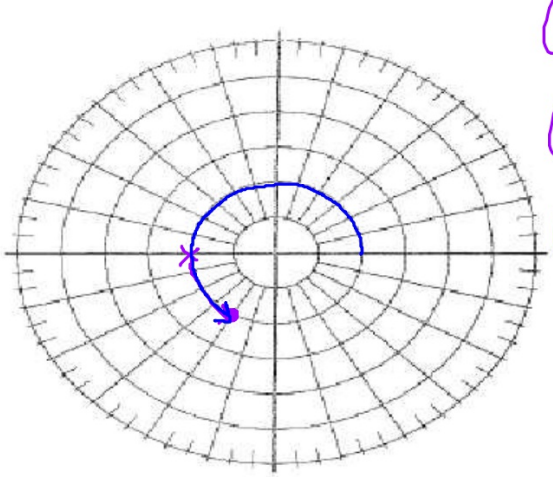
The Cartesian coordinates of a point are given. Plot the point and then find 4 polar representations of the curve

19) $(-1,-\sqrt{3})$

$r = \sqrt{1^2+\sqrt{3}^2} = \sqrt{1+3} = 2$

$\theta = \tan^{-1}\left(\frac{-\sqrt{3}}{-1}\right)$

$\theta = 60^\circ$



$(-2, 60^\circ)$

$(-2, -300^\circ)$

$(2, 240^\circ)$

$(2, -120^\circ)$

Identify the curve by finding a Cartesian/Rectangular equation for the curve.

12. $r = 2$ circle

$\sqrt{x^2+y^2} = 2$ $r = \sqrt{x^2+y^2}$

$x^2+y^2=4$

Identify the curve by finding a Cartesian/Rectangular equation for the curve.

$$r\cos\theta = 1$$

$x = 1$

Vertical Line

Identify the curve by finding a Cartesian/Rectangular equation for the curve.

$(r = 3\sin\theta)\, r$

$x = r\cos\theta$

$y = r\sin\theta$

$r = \sqrt{x^2+y^2}$

$r^2 = 3r\sin\theta$

$r^2 = x^2 + y^2$

$x^2 + y^2 = 3y$

Circle

Identify the curve by finding a Cartesian/Rectangular equation for the curve.

$$r = \tan\theta \sec\theta$$

$(\cos\theta)\, r = \left(\frac{\sin\theta}{\cos\theta}\right)\left(\frac{1}{\cos\theta}\right)(\cos\theta)$

$r\cos\theta = \frac{\sin\theta}{\cos\theta}$

$(\cos\theta)\, x = \frac{\sin\theta\,(\cos\theta)}{\cos\theta}$

$(x\cos\theta = \sin\theta)\, r$

$x(r\cos\theta) = r\sin\theta$

$x(x) = y$

$x^2 = y$

Parabola

Find a polar equation for the curve represented by the given Cartesian equation.

16. $x = 3$

$\frac{r\cos\theta}{\cos\theta} = \frac{3}{\cos\theta}$

$r = \frac{3}{\cos\theta}$

$r = 3\sec\theta$

Find a polar equation for the curve represented by the given Cartesian equation.

$$x^2 + y^2 = 9$$

$r^2 = 9$

Circle

Find a polar equation for the curve represented by the given Cartesian equation.

$$x = -y^2$$

$r\cos\theta = -(r\sin\theta)^2$

$r\cos\theta = -r^2\sin^2\theta$

Find a polar equation for the curve represented by the given Cartesian equation.

$$x + y = 9$$

$r\cos\theta + r\sin\theta = 9$

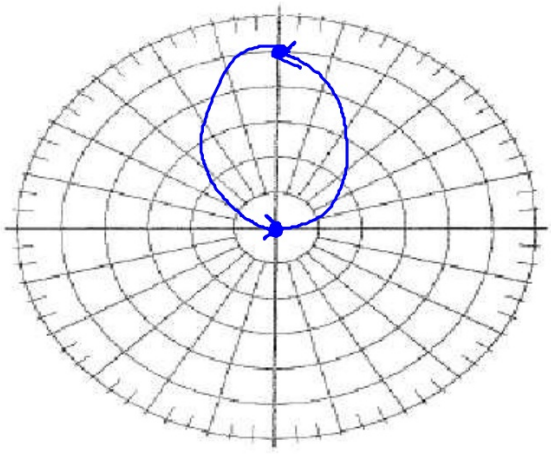
$r(\cos\theta + \sin\theta) = 9$

$$r = \frac{9}{\cos\theta + \sin\theta}$$

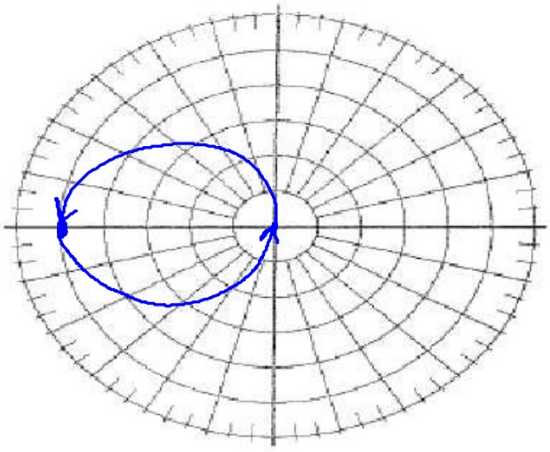
Sketch the curve with the given polar equation

Circle

$r = 5\sin\theta$



$r = -5\cos\theta$



Sketch the curve with the given polar equation

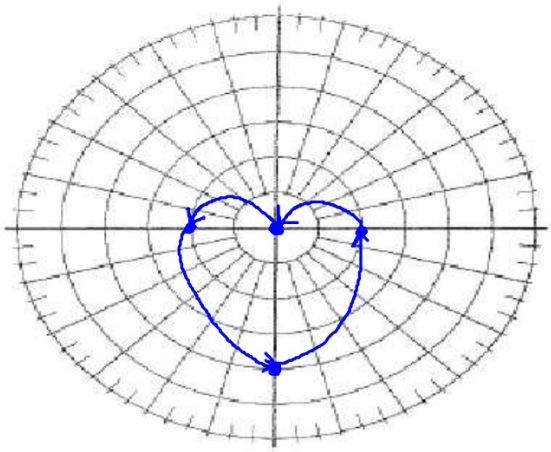
CARDIOD

$r = 2 - 2\sin\theta$

right/left

$\theta = 0$

$r = 2$

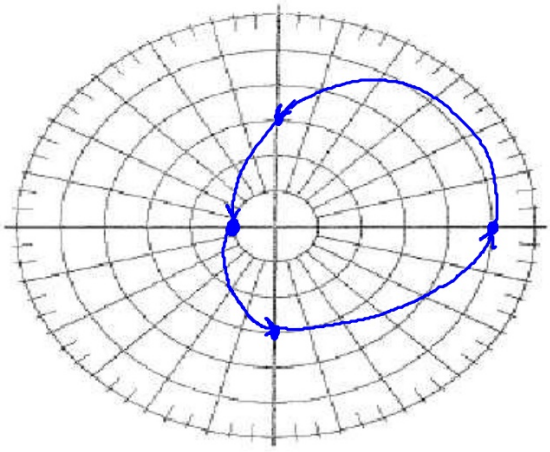


Dimpled Limacon

$r = -3 + 2\cos\theta$

$\theta = 0$

$r = -3 + 2 = -1$

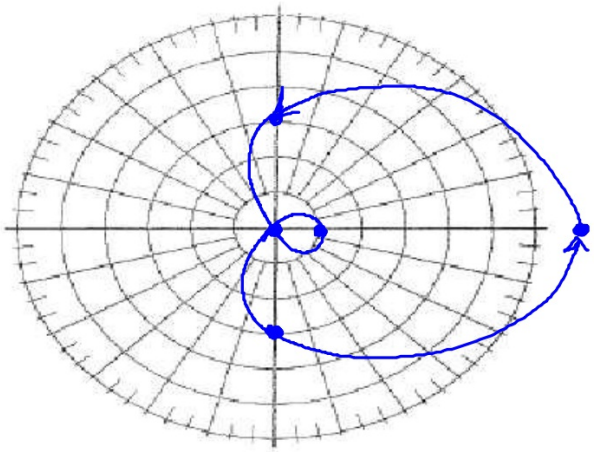


Sketch the curve with the given polar equation

Loop

$r = 3 + 4\cos\theta$

$\theta = 0$
$r = 7$

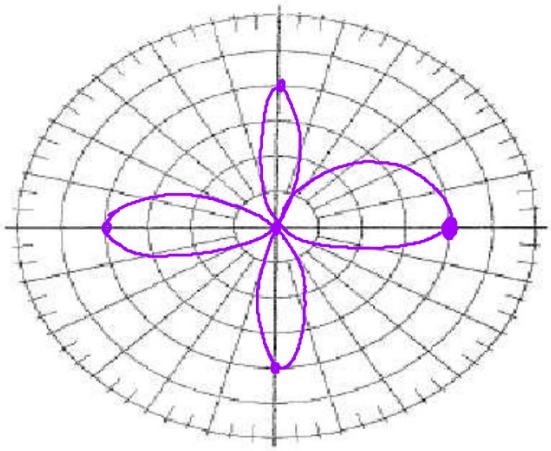


Rose

$r = 4\cos 2\theta$

$\frac{360}{4} = 90^\circ$

$\theta = 0$
$r = 4$



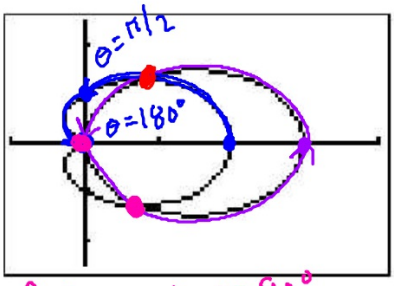
a) Find where each of the curves is when $\theta = 0$.

b) Find where each of the curves is when $\theta = \frac{\pi}{2}$

c) Using your information from parts a and b identify the direction the curve is moving.

d) Find when each curve is at the pole. e)Find where the 2 curves intersect.

26. the circle r = 3cosθ and the cardiod r = 1 + cosθ



Pole: circle $\theta = 90°$

cardiod $\theta = 180°$

$r = 3\cos\theta$

a) $\theta = 0$ $r = 3$

b) $\theta = \frac{\pi}{2}$ $r = 3\cos\frac{\pi}{2}$ $r = 0$

c) $\theta = \pi/2$

a) $\theta = 0$ $r = 1 + 1 = 2$

b) $\theta = \frac{\pi}{2}$ $r = 1 + 0 =$

d) $0 = 1 + \cos\theta$

$-1 \quad -1$

$-1 = \cos\theta$

$\theta = 180°$

$3\cos\theta = 1 + \cos\theta$

$-\cos\theta \qquad -\cos\theta$

$\frac{2\cos\theta}{2} = \frac{1}{2}$

$\cos\theta = \frac{1}{2}$

$\theta = 60°$

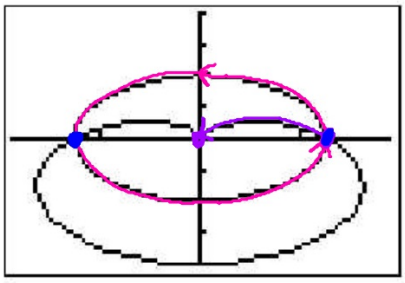
a) Find where each of the curves is when $\theta = 0$.

b) Find where each of the curves is when $\theta = \frac{\pi}{2}$

c) Using your information from parts a and b identify the direction the curve is moving.

d) Find when each curve is at the pole. e)Find where the 2 curves intersect.

27. the circle r = 2 and the cardiod r = $2(1 - \sin\theta)$



$\theta = 0 \quad r = 2$

$\theta = \frac{\pi}{2} \quad r = 2$

never at pole

$\theta = 0 \quad r = 2(1-0) = 2$

$\theta = \pi/2 \quad r = 2(1-1) = 0$

at pole $\theta = \pi/2$

$0 = 2 - 2\sin\theta$

$-2 \quad -2$

$-2 = -2\sin\theta$

$1 = \sin\theta$

$2 = 2(1 - \sin\theta)$

$2 = 2 - 2\sin\theta$

$-2 \quad -2$

$0 = -2\sin\theta$

$\frac{0}{-2} = \frac{-2\sin\theta}{-2}$

$0 = \sin\theta$

$\theta = 0^\circ / 180^\circ$

	sin	cos
30	$1/2$	$\sqrt{3}/2$
45	$\sqrt{2}/2$	$\sqrt{2}/2$
60	$\sqrt{3}/2$	$1/2$