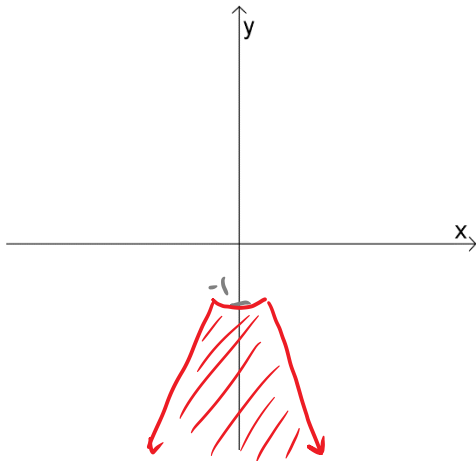
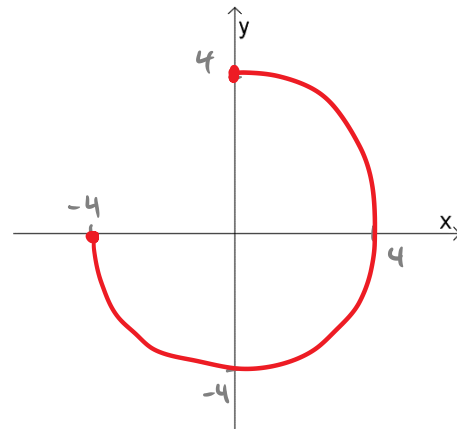


1. Graph the following regions.

$$\frac{4\pi}{3} \leq \theta \leq \frac{5\pi}{3} \text{ and } r \geq 1$$



$$0 \leq \theta \leq \frac{3\pi}{2} \text{ and } r = -4$$



2. Find a polar equation (that has been solved for r) for $x^2 + y^2 = 9$.

$$r^2 = 9$$

$$\downarrow \quad \downarrow$$

$$r = 3 \text{ or } r = -3$$

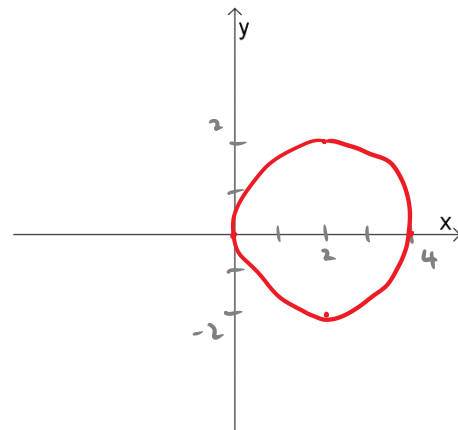
3. Replace $r^2 = 4r \cos \theta$ with an equivalent Cartesian equation. Graph it.

$$x^2 + y^2 = 4x$$

$$x^2 - 4x + y^2 = 0$$

$$x^2 - 4x + 4 + y^2 = 0 + 4$$

$$(x-2)^2 + y^2 = 4$$

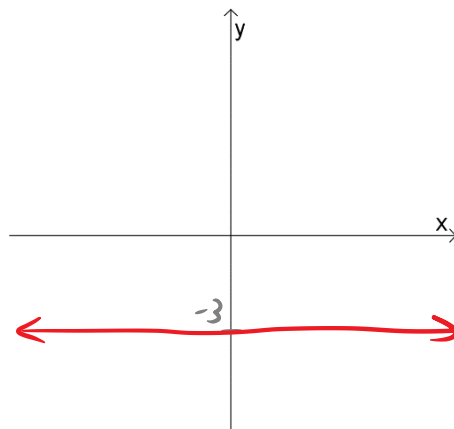


4. Replace $r = -3 \csc \theta$ with an equivalent Cartesian equation. Graph it.

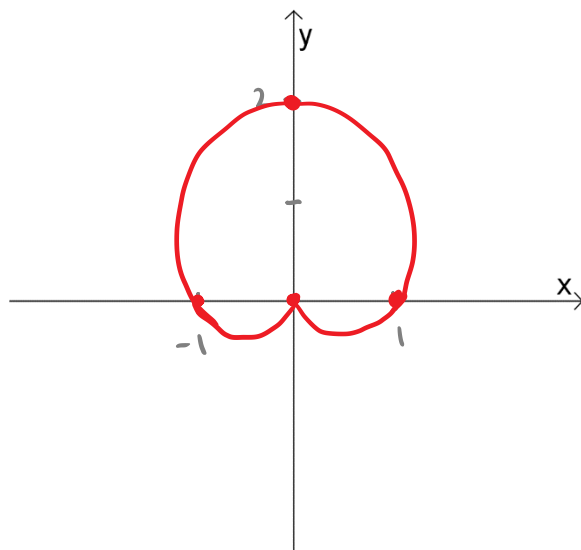
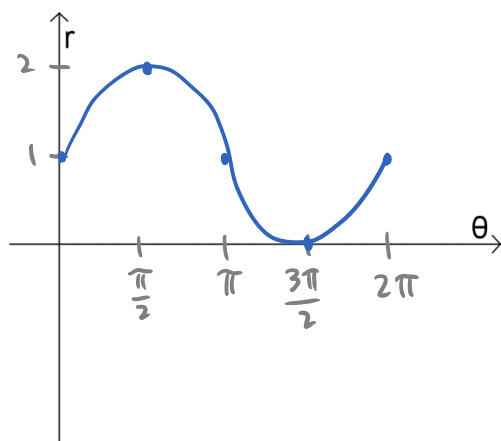
$$r = \frac{-3}{\sin \theta}$$

$$r \sin \theta = -3$$

$$\boxed{y = -3}$$



5. Graph the curve $r = 1 + \sin \theta$.



Symmetry:

$$\left. \begin{array}{l} r = 1 + \sin(\pi - \theta) \\ r = 1 + \sin \theta \end{array} \right\} \text{Symmetric about } y\text{-axis}$$

Note: $r = 0$ at $\theta = \frac{3\pi}{2}$

6. Find the slope of the curve $r = \cos 2\theta$ at $\theta = 0, \frac{\pi}{2}, -\frac{\pi}{2},$ and π . Then graph the curve.

$$f'(\theta) = -2\sin 2\theta$$

$$\frac{dy}{dx} = \frac{-2\sin 2\theta \sin \theta + \cos 2\theta \cos \theta}{-2\sin 2\theta \cos \theta - \cos 2\theta \sin \theta}$$

θ	$\frac{dy}{dx}$
0	undefined
$\frac{\pi}{2}$	0
$-\frac{\pi}{2}$	0
π	undefined

Since $\cos 2\theta = \cos^2 \theta - \sin^2 \theta$, we will have symmetry about the x-axis and y-axis.

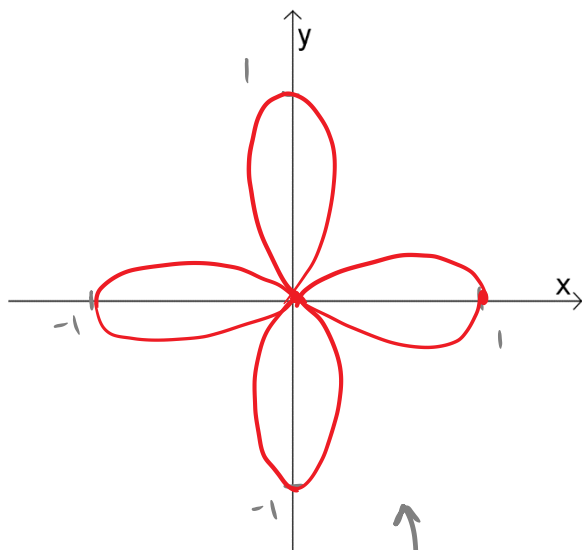
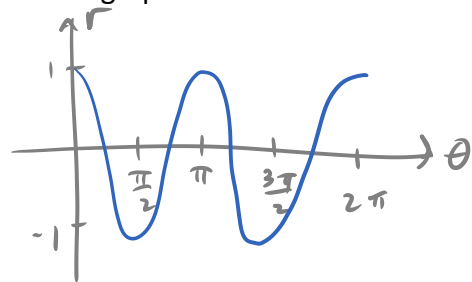
(Since, for example,

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

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

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

$$r = \cos 2\theta)$$



↑
four-leaved rose

Q: Suppose your boyfriend/girlfriend sends you this text message:

A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q,R,S,T,V,W,X,Y,Z.

What does the message mean?