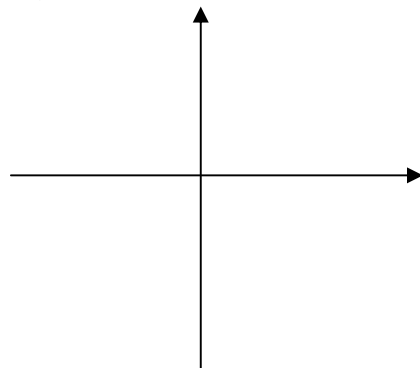


11.4: Graphing in Polar Coordinates

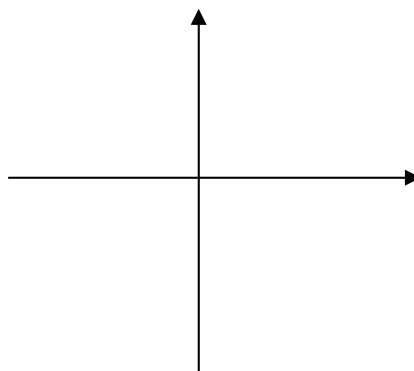
Polar Curves:

The graph of a polar equation $r = f(\theta)$ consists of all points (r, θ) that satisfy the equation.

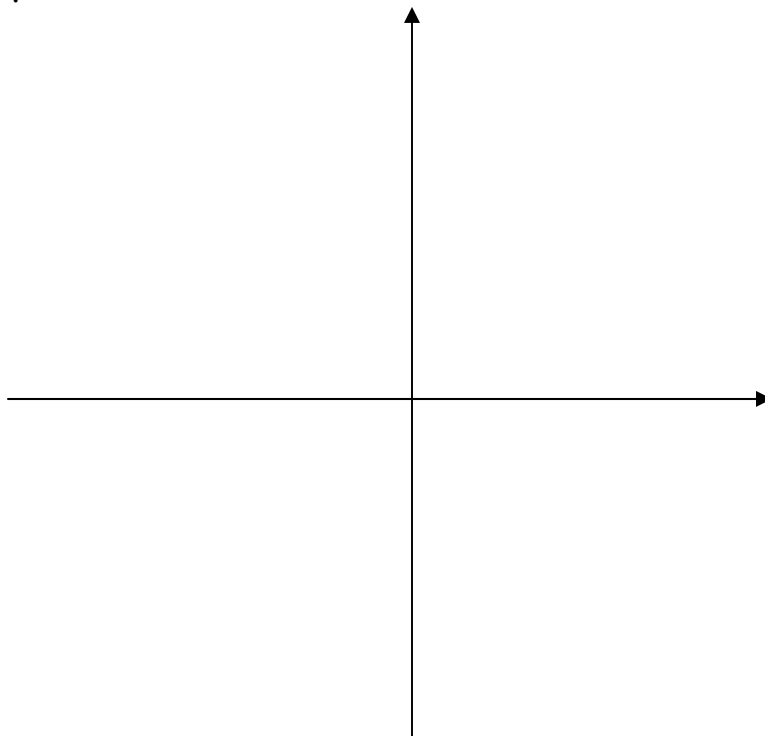
Example 1: Sketch the curve $\theta = -\pi/3$.



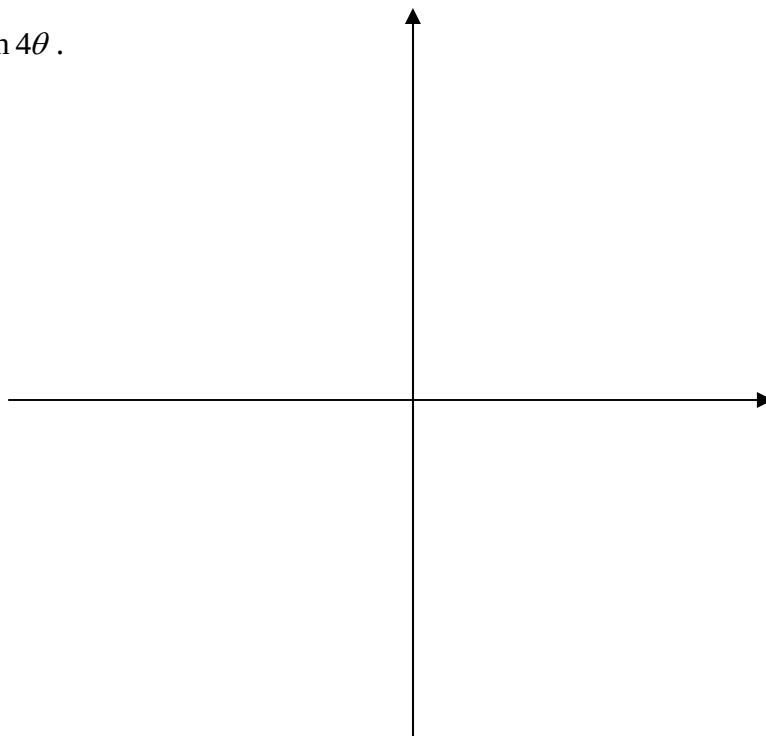
Example 2: Sketch the curve $r = 5$.



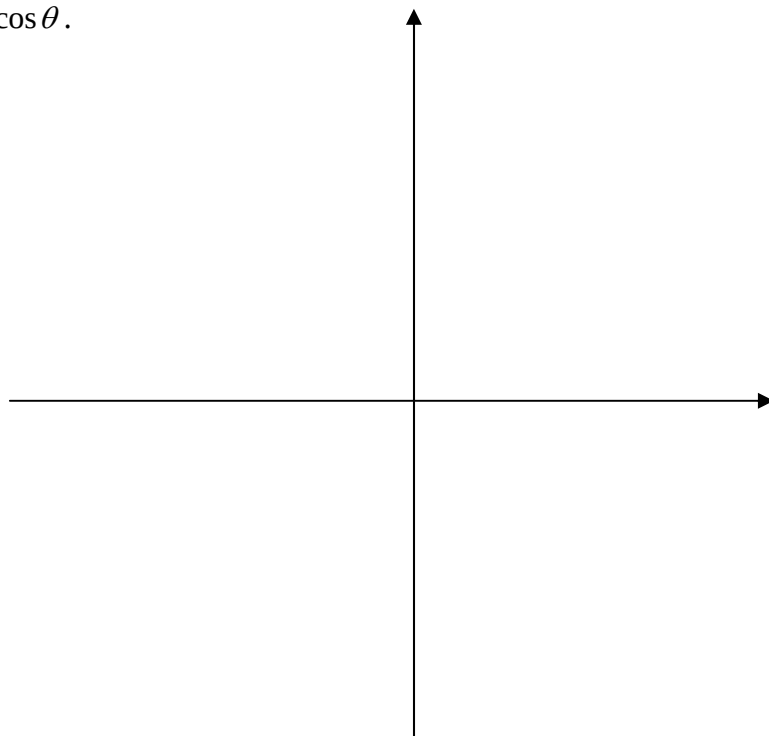
Example 3: Sketch the curve $r = 2 \cos 3\theta$.



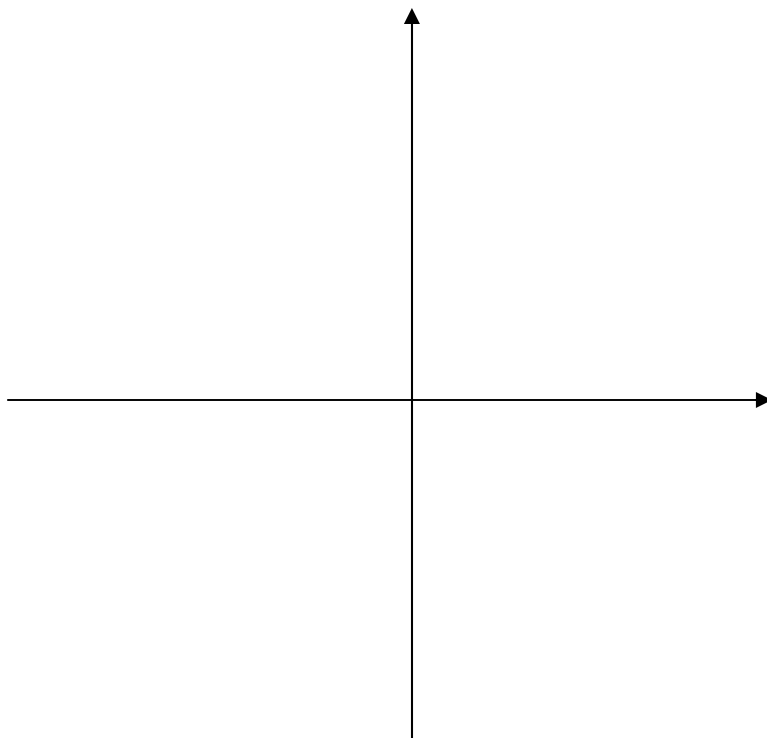
Example 4: Sketch the curve $r = 3\sin 4\theta$.



Example 5: Sketch the curve $r = 1 + 2\cos \theta$.



Example 6: Sketch the curve $r^2 = 4 \cos \theta$.



Tangents to Polar Curves:

Suppose we wish to calculate the slope of the tangent line to the polar curve $r = f(\theta)$. The slope is dy/dx . We'll need to use the conversion equations $y = r \sin \theta$ and $x = r \cos \theta$ and the product rule

$$\frac{dy}{dx} = \frac{\frac{dy}{d\theta}}{\frac{dx}{d\theta}} = \frac{\frac{dr}{d\theta} \sin \theta + r \cos \theta}{\frac{dr}{d\theta} \cos \theta - r \sin \theta}$$

Example 7: Consider the polar graph $r = 1 - \sin \theta$

- a) Find the slope of the tangent line at the point where $\theta = \pi/6$.
- b) Find the slope of the tangent line at the point where $\theta = \pi/4$.
- c) Find the values of θ for which the tangent line is horizontal.
- d) Find the values of θ for which the tangent line is vertical.