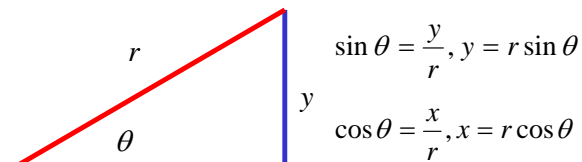
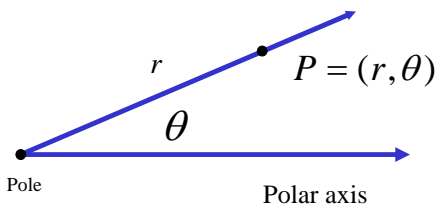


### Polar Coordinates



$$\sin \theta = \frac{y}{r}, y = r \sin \theta$$

$$\cos \theta = \frac{x}{r}, x = r \cos \theta$$

$$\tan \theta = \frac{y}{x}, \theta = \tan^{-1} \frac{y}{x}$$

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

Find polar coordinates of a point whose rectangular coordinates are (0,3).

$$r = \sqrt{x^2 + y^2} = \sqrt{3^2 + 0^2} = 3$$

$$\theta = \tan^{-1} \frac{y}{x} = \tan^{-1} \frac{3}{0}$$

Use  $\theta = \frac{\pi}{2}, (r, \theta) = (3, \frac{\pi}{2})$

An equation whose variables are polar coordinates is called a **polar equation**. The **graph of a polar equation** consists of all points whose polar coordinates satisfy the equation.

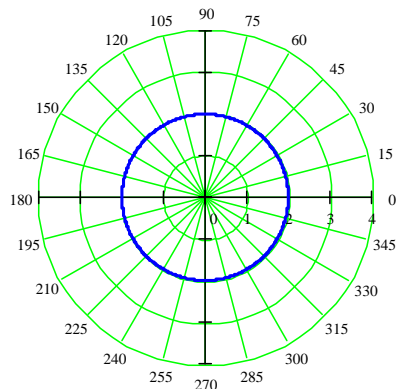
Identify and graph the equation:  $r = 2$

$$r = 2$$

$$r^2 = 4$$

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

Circle with center at the pole and radius 2.

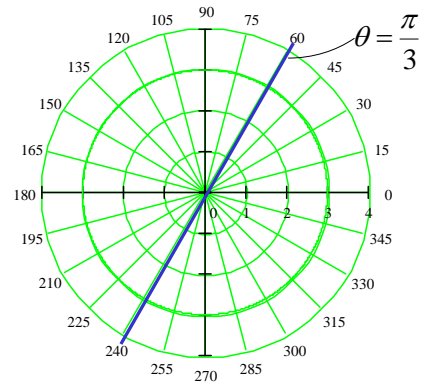


Identify and graph the equation:  $\theta = \frac{\pi}{3}$

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

$$\frac{y}{x} = \frac{\sqrt{3}}{1}$$

$$y = \sqrt{3}x$$



Identify and graph the equation:  $r \sin \theta = -2$

$$\sin \theta = \frac{y}{r} \Rightarrow y = r \sin \theta$$

$$y = -2$$

