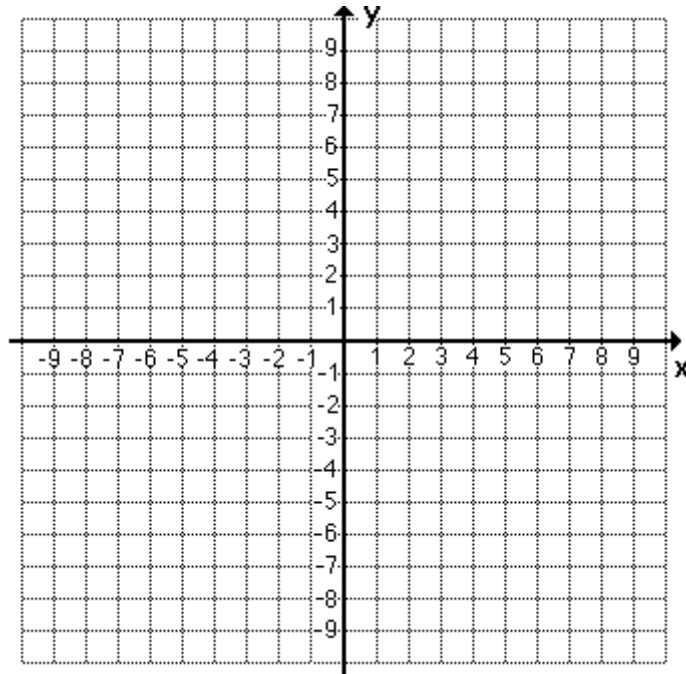


POLAR COORDINATES

Rectangular Coordinate System

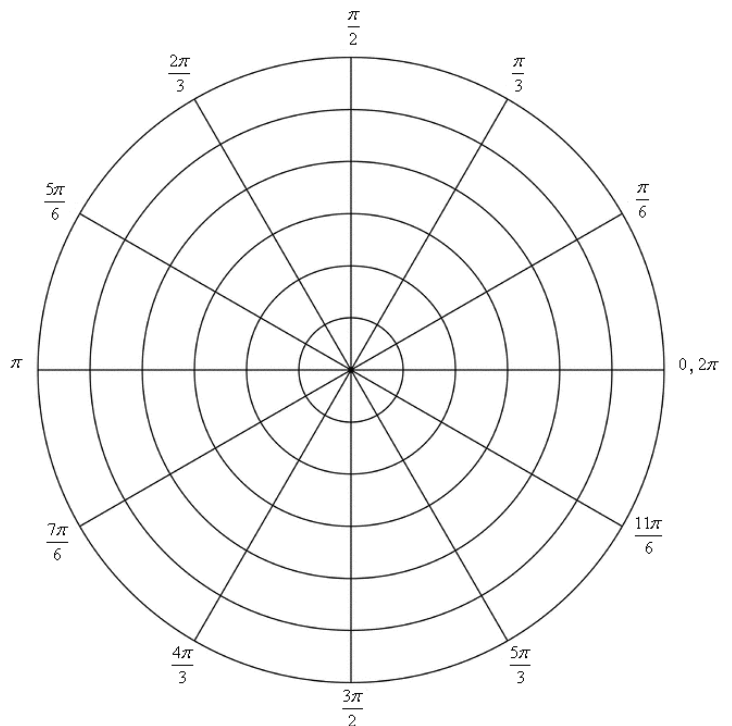
Movement is determined by the coordinates (x,y)



Polar Coordinate System

Movement is determined by the polar coordinates

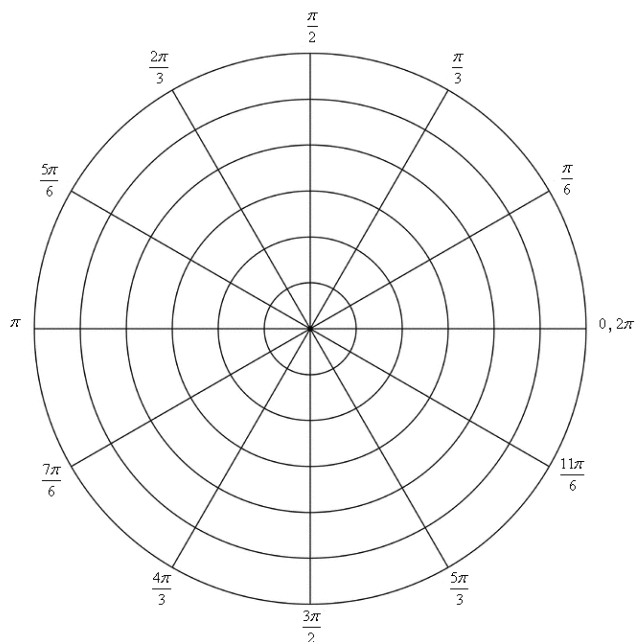
(r, θ)



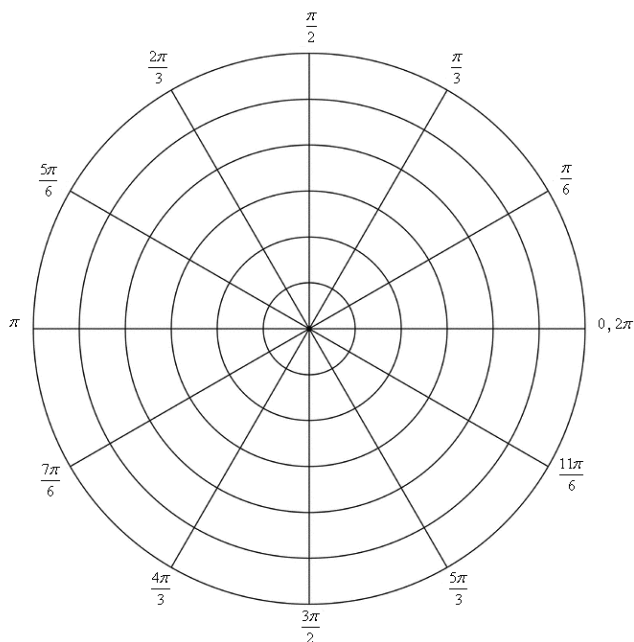
Examples:

Plot the following.

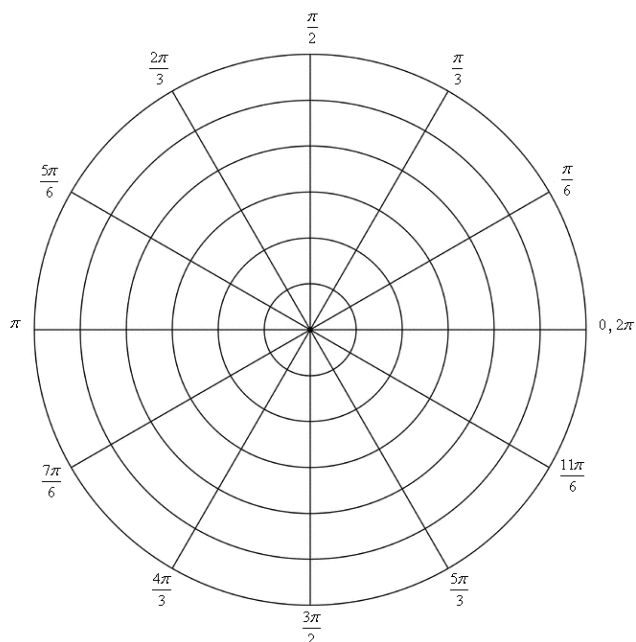
$$\left(3, \frac{5\pi}{3}\right)$$



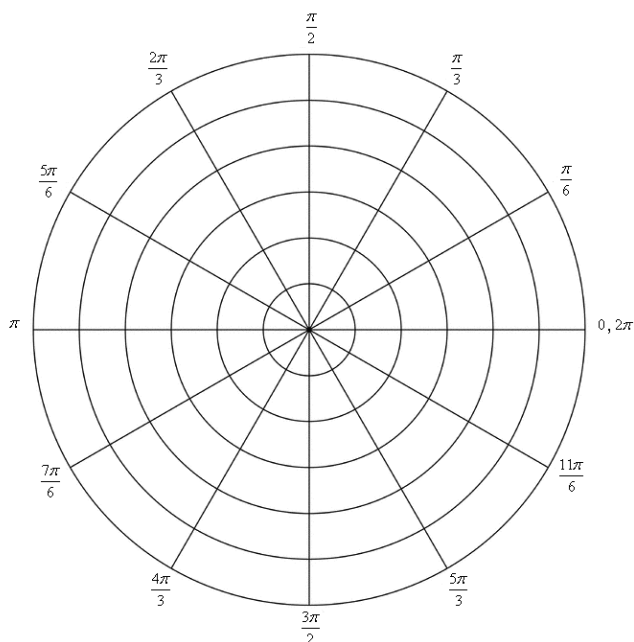
$$\left(-4, \frac{7\pi}{6}\right)$$



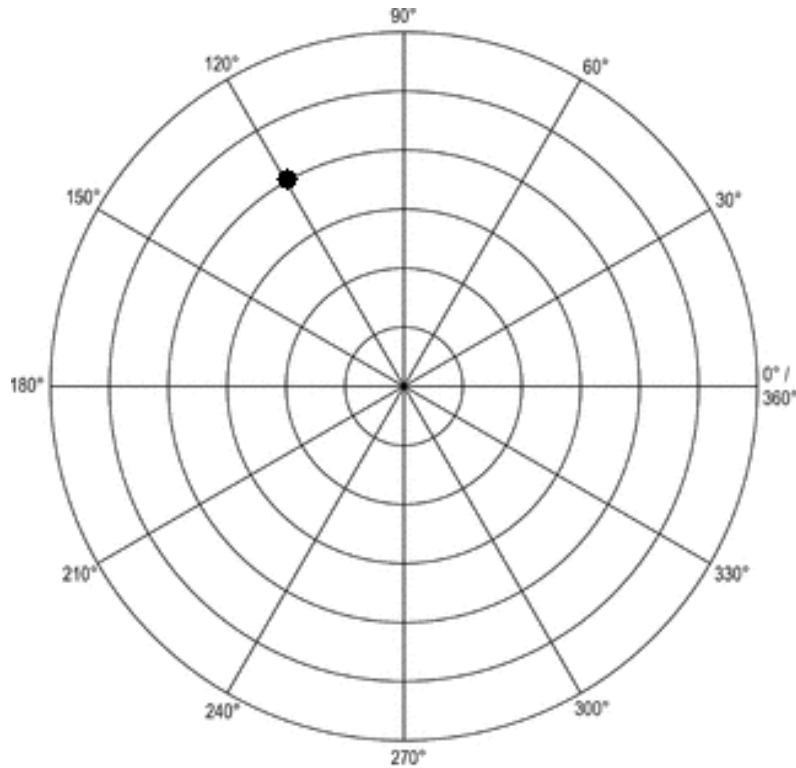
$$(3, -120^\circ)$$



$$\left(5, \frac{9\pi}{4}\right)$$



Write the polar coordinates for the graph below 7 different ways.



A _____

B _____

C _____

D _____

E _____

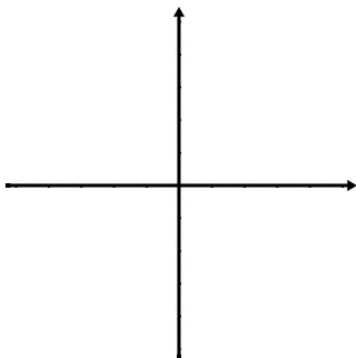
F _____

G _____

CONVERTING COORDINATES FROM RECTANGULAR FORM TO POLAR FORM

Rectangular Form

Polar Form



Examples:

Convert $(2, -2\sqrt{3})$ to polar form

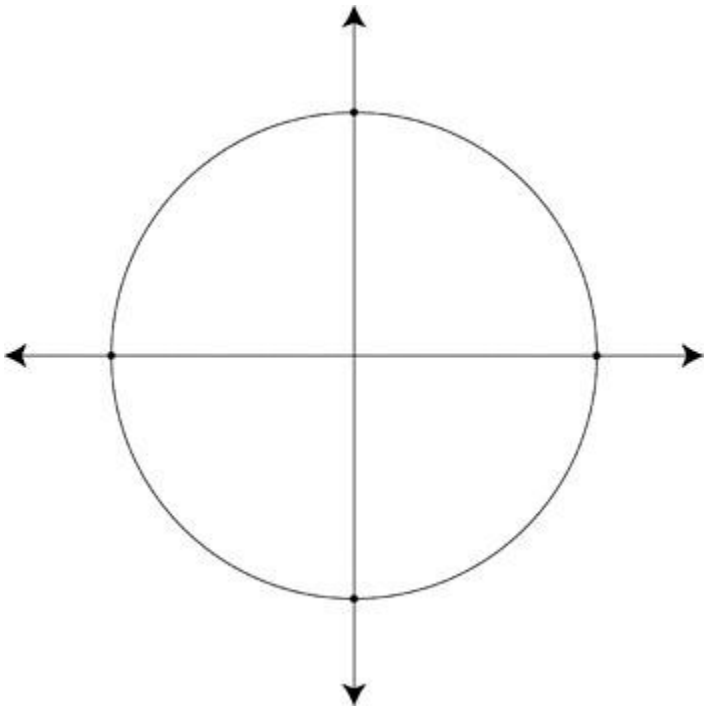
$$r = \sqrt{x^2 + y^2}$$

$$\theta = \tan^{-1}\left(\frac{y}{x}\right)$$

Convert $(-5, -5)$ to polar form

Convert $(4\sqrt{3}, 4)$ to polar form

CONVERTING COORDINATES FROM POLAR FORM TO RECTANGULAR FORM



Converting Polar $\rightarrow$ Rectangular

$$(r, \theta) \rightarrow (r \cos \theta, r \sin \theta)$$

Convert $\left(4, \frac{5\pi}{3}\right)$ to rectangular form.

$$(r, \theta) \rightarrow (r \cos \theta, r \sin \theta)$$

Convert $(6, 180^\circ)$ to rectangular form.

Convert $\left(-6, \frac{4\pi}{3}\right)$ to rectangular form.

POLAR COORDINATES CONTINUED

Writing Equations in Polar Form

$$(x, y) \rightarrow (r, \theta) \rightarrow (r \cos \theta, r \sin \theta)$$

I can convert an equation from Rectangular Form to Polar Form.

I can convert an equation from Polar Form to Rectangular Form.

Convert Rectangular $\rightarrow$ Polar Form

Replace

$$x = r \cos \theta$$

$$y = r \sin \theta$$

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

Polar $\rightarrow$ Rectangular Form

$$r \cos \theta = x$$

$$r \sin \theta = y$$

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

$$\tan \theta = \frac{y}{x}$$

Convert to Polar Form

$$5x - 12y - 7 = 0$$

$$y = x$$

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

Convert to Rectangular Form

$$r = 3$$

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

$$r = \frac{2}{1 + \sin \theta}$$