What you'll Learn About

- Polar Coordinate System/Coordinate Conversion
- Equation Conversion/Finding Distance using Polar coordinates

$(x, y) \rightarrow$ Rectangular

$(r, \theta) \rightarrow$ Polar

(Radius, Angle)

θ is Positive
Rotate Counter Clockwise

θ is negative
Rotate clockwise

r is positive
Start at $0°$

r is negative
Start at $180°$
(negative pole)

(r, θ)

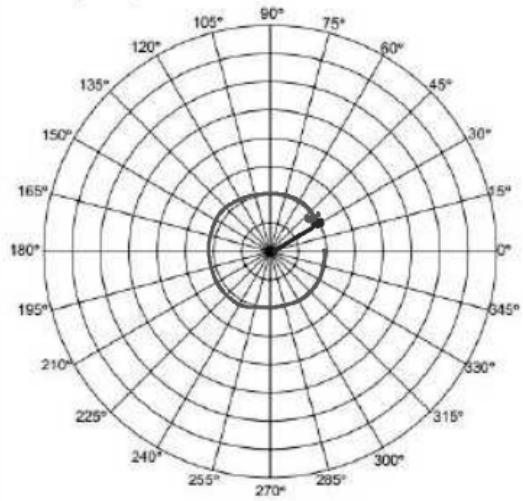
$(-r, \theta)$

$(r, -\theta)$

$(-r, -\theta)$

Plot the given polar coordinate and then give the other 3 representations of the polar coordinate.

A) $(2, 30°)$



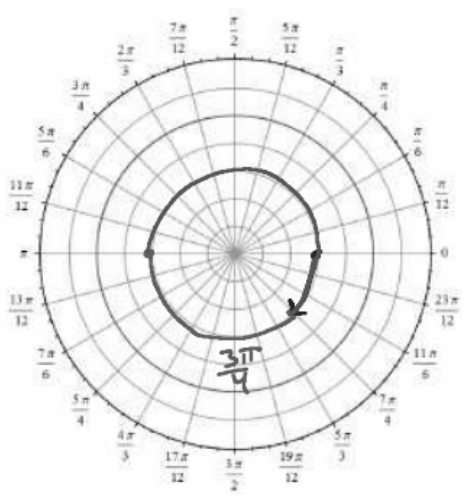
$(2, 30°)$

$(2, -330°)$

$(-2, 210°)$

$(-2, -150°)$

B) $\left(-3, \frac{3\pi}{4}\right)$



$\left(-3, \frac{3\pi}{4}\right)$

$\left(3, \frac{7\pi}{4}\right)$

$\left(3, -\frac{\pi}{4}\right)$

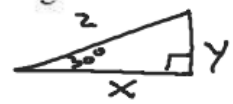
$\left(-3, -\frac{5\pi}{4}\right)$

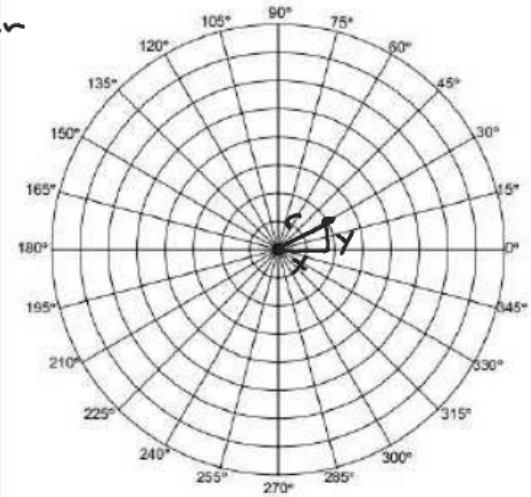
$(r, \theta) \rightarrow$ Polar

$(x, y) \rightarrow$ Rectangular

Given the polar coordinates of a point, find its rectangular coordinates.

A) $(2, 30^\circ) \longrightarrow (\sqrt{3}, 1)$





$\cos 30^\circ = \frac{x}{2}$

$x = 2\cos 30^\circ$

$= 2\left(\frac{\sqrt{3}}{2}\right)$

$= \sqrt{3}$

$\sin 30^\circ = \frac{y}{2}$

$y = 2\sin 30^\circ$

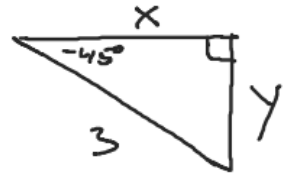
$= 2\left(\frac{1}{2}\right)$

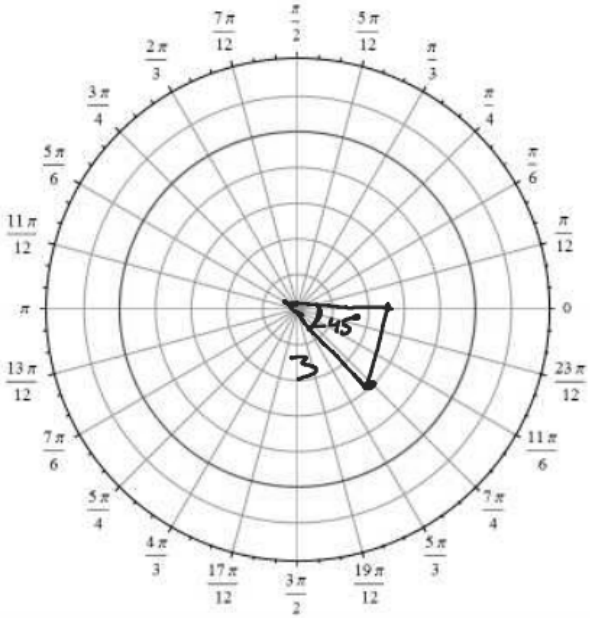
$= 1$

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

$(2.12, -2.12)$

B) $\left(-3, \frac{3\pi}{4}\right) \rightarrow (-3, 135^\circ)$





$\cos(-45^\circ) = \frac{x}{3}$

$3\cos(-45^\circ) = x$

$3\left(\frac{\sqrt{2}}{2}\right)$

$\frac{3\sqrt{2}}{2} = x$

$\sin(-45^\circ) = \frac{y}{3}$

$3\sin(-45^\circ) = y$

$y = 3\left(\frac{-\sqrt{2}}{2}\right)$

$= -\frac{3\sqrt{2}}{2}$

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

$x = r\cos\theta$

$y = r\sin\theta$

Without graphing, use an algebraic method to convert the following polar coordinates to rectangular.

A) $\left(3, \frac{5\pi}{6}\right) \rightarrow \left(-\frac{3\sqrt{3}}{2}, \frac{3}{2}\right)$

$x = 3\cos\frac{5\pi}{6}$

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

$-\frac{3\sqrt{3}}{2}$

$y = 3\sin\frac{5\pi}{6}$

$3\left(\frac{1}{2}\right) = \frac{3}{2}$

B) $(2, -200^\circ)$

$x = 2\cos(-200^\circ)$

$= -1.9$

$y = 2\sin(-200^\circ)$

$= .68$

$(-1.9, .68)$

Given the rectangular coordinates, find 4 polar coordinates that represent the coordinate.

A) P(-1, 1)

B) (5, - 6)

C) (-3, 0)