DATE: _____

6.3 Polar Coordinates

Target 10D: Understand the Polar Coordinate System by performing Polar/Rectangular Coordinate Conversions

Review of Prior Concepts

1. Find the magnitude of the vector $\langle\sqrt{3}, 1\rangle$.

magnitude $= \sqrt{(\sqrt{3})^2+(1)^2}$

$= \sqrt{3+1}$

$= \sqrt{4}$

$= \boxed{2}$

2. Find the direction angle of the vector $\langle\sqrt{3}, 1\rangle$.

$\cos\theta = \frac{\sqrt{3}}{2}$ or $\sin\theta = \frac{1}{2}$

$\theta = \pi/6$

Polar Coordinates

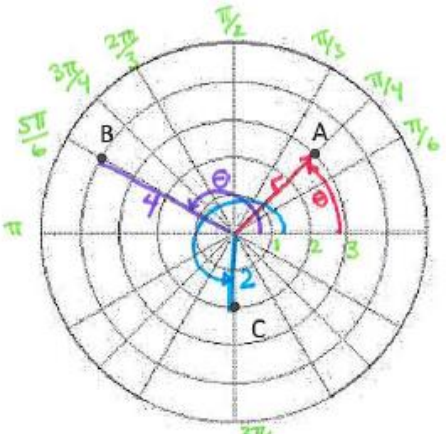
(r, θ)

The polar coordinates of point A is $(3, 45°)$ *or* $\left(3, \frac{\pi}{4}\right)$.

Example 1: Identify the coordinates of:

a) point B $(4, 5\pi/6)$

b) point C $(2, 3\pi/2)$

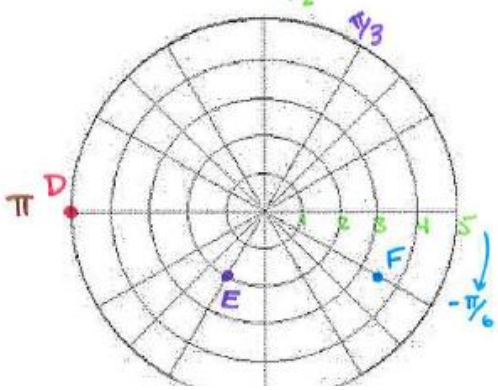


Example 2: Plot each of the given points:

a) D $(5, \pi)$

b) E $\left(-2, \frac{\pi}{3}\right)$

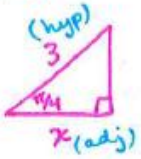
c) F $\left(3.5, -\frac{\pi}{6}\right)$

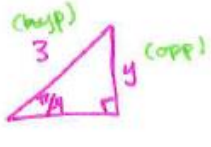


Example 3:

Determine the rectangular (x, y) coordinates of point A.

A $(3, \pi/4)$



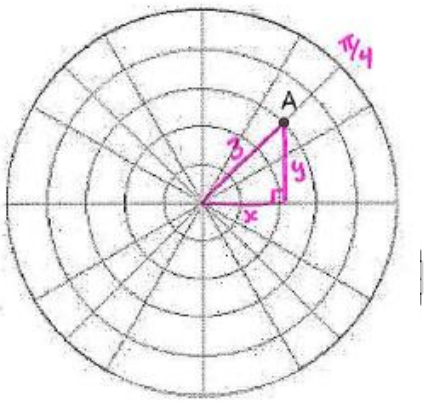


$\cos\frac{\pi}{4} = \frac{x}{3}$ $\quad \sin\frac{\pi}{4} = \frac{y}{3}$

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

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

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



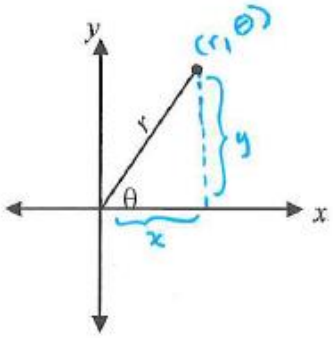
Convert Polar Coordinates to Rectangular Coordinates

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

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

$r\cos\theta = x$ $r\sin\theta = y$

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



Example 4:

Convert $\left(2, \frac{5\pi}{6}\right)$ to rectangular coordinates.

r, θ

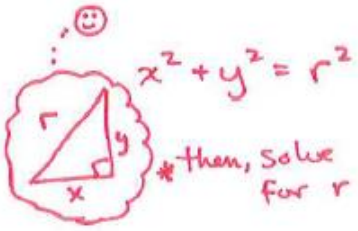
$(2\cos\frac{5\pi}{6}, 2\sin\frac{5\pi}{6})$

$(2(-\frac{\sqrt{3}}{2}), 2(\frac{1}{2}))$

$(-\sqrt{3}, 1)$

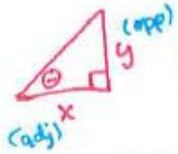
Convert Rectangular Coordinates to Polar Coordinates

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



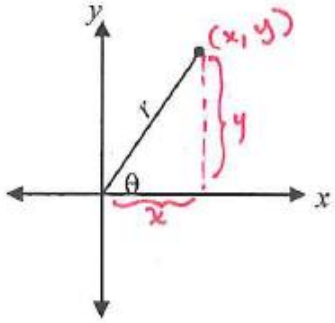
$x^2 + y^2 = r^2$

* then, solve for r



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

* then, solve for θ



Example 5:

Convert $\left(3\sqrt{2}, 3\sqrt{2}\right)$ to polar coordinates.

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

$(3\sqrt{2})^2 + (3\sqrt{2})^2 = r^2$

$18 + 18 = r^2$

$36 = r^2$

$6 = r$

$\tan\theta = \frac{3\sqrt{2}}{3\sqrt{2}}$

$\tan\theta = 1$

$\theta = \pi/4$

$\frac{\sin\theta}{\cos\theta} = 1$

$= \frac{\sqrt{2}/2}{\sqrt{2}/2}$ ... ☺

$(6, \pi/4)$

More Practice

Polar Coordinates

http://mathinsight.org/polar_coordinates
https://www.mathsisfun.com/polar-cartesian-coordinates.html
http://math.illinois.edu/~rasekh2/math231(s2016)/PolarEquations.pdf
http://tutorial.math.lamar.edu/Classes/CalcII/PolarCoordinates.aspx
http://www.mathwords.com/p/polar_rectangular_conversion_formulas.htm
https://youtu.be/r0fv9V9GHdo
https://youtu.be/jexMSlSDubM
https://youtu.be/2RQk9P-EVpQ
https://youtu.be/L4v98ZZft68

Homework Assignment

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