

## Math 1060 ~ Trigonometry

### 17 Polar Coordinates and Equations

#### Learning Objectives

In this section you will:

- Graph points in polar coordinates.
- Convert points in polar coordinates to rectangular coordinates and vice versa.
- Convert between rectangular and polar equations.

$\sin^2 u + \cos^2 u = 1$

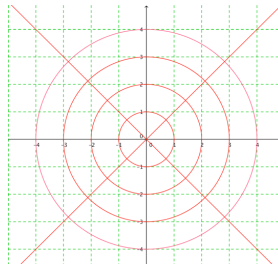
$\sin 2u = 2 \sin u \cos u$

$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

$c^2 = a^2 + b^2 - 2ab \cos C$

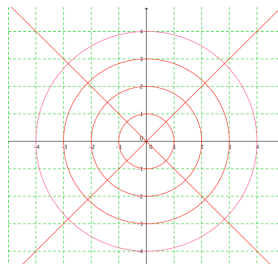
Rectangular Coordinates

$(x, y)$



Polar Coordinates

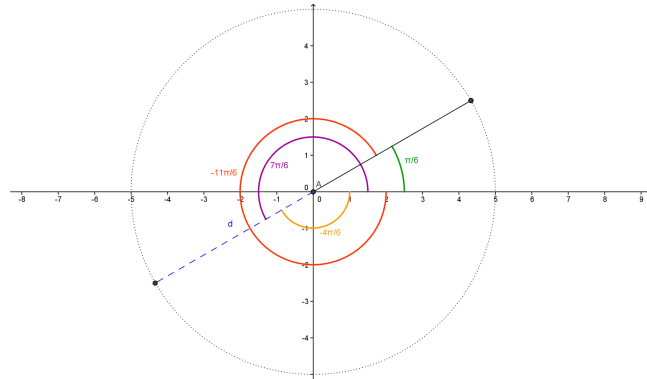
$(r, \theta)$



In fact:

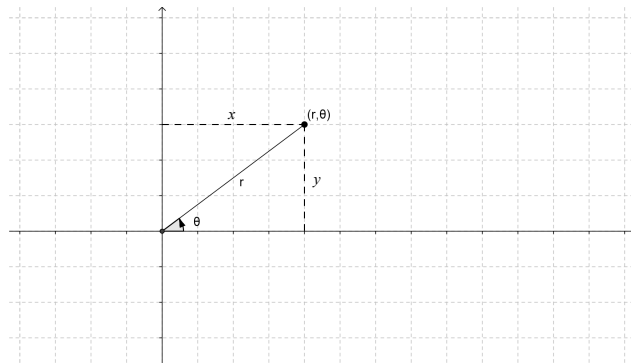
$(r, \theta)$  has infinitely many representations:

$(r, \theta + 2n\pi)$  and  $(-r, \theta + (2n+1)\pi)$ , where  $n$  is any integer

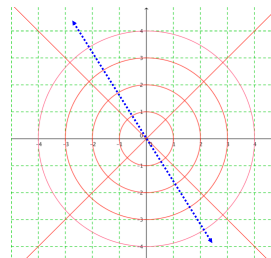


How do we translate between Cartesian and polar coordinates?

Polar to Cartesian:

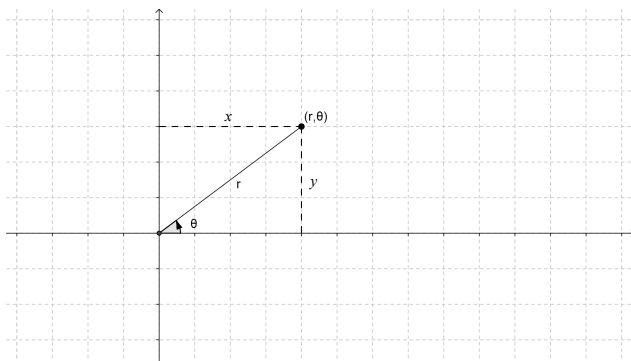


Ex1: Convert  $(-4, 2\pi/3)$  to Cartesian coordinates.

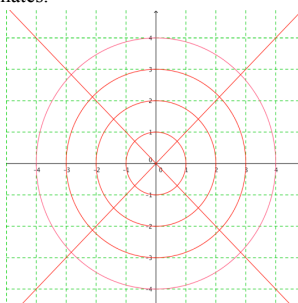


How do we translate between Cartesian and polar coordinates?

Cartesian to polar:



Ex 2: Convert  $(-2, 2)$  to polar coordinates.



We can convert equations, too!

Ex 3:

(a) Convert  $x^2 - 3x = 1 + xy$  into polar coordinates.

(b) Convert  $r = -2\cos \theta$  into Cartesian coordinates.