Polar Coordinates
Section 10.4a

As you know, the regular way that we write and graph equations is in ___________________________ form. Certain curves are easier to handle using Polar Graphing and Polar Equations. It is particularly nice to use Polar equations for things that ________________________ or for conic sections.

**Polar Coordinates**
Polar coordinates are written in the form (r, θ) where r is ___________________________ and θ is the angle measured from the positive x – axis, which is called the ___________________________. In Polar graphing, the ___________________________ is called the _____________.

Consider the graph below with the point \(2, \frac{π}{4}\). We can find many other ways to name this point in polar form.
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We need to be able to convert between Polar and Rectangular forms.
Copy the sketch below:

Coordinate Conversion
The following conversion formulas are for polar coordinates \((r, \theta)\) and rectangular coordinates \((x, y)\).

1. \(x = r \cos \theta\)  
   \(y = r \sin \theta\)

2. \(\tan \theta = \frac{y}{x}\)
   \(r^2 = x^2 + y^2\)

Try these problems:
1. Convert the polar point \(\left(2, \frac{2\pi}{3}\right)\) to rectangular form.

2. Convert the rectangular point \(\left(2, -\sqrt{2}\right)\) to polar form.

Note: Always be careful about which quadrant you are in!
3. Convert the equation for a circle, \(x^2 + y^2 = 9\), to an equation in polar form:
4. Convert the equation $\theta = \frac{\pi}{6}$ into rectangular form.