KI_04_23_22

> Trying out Inkdrop with in a session with KI

Polar and Rectangular Coordinates

Polar-Rectangular Conversions

$$x = rcos(\theta)$$
$$y = rsin(\theta)$$

More relationships

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

Example 1

Convert this equation into polar form

$$x^2 + y^2 = 9$$

First substitute the polar-rectangular conversions into the equation. This gives us

$$(rcos(\theta))^2 + (rsin(\theta))^2 = 9$$

In a sense, you have successfully converted the equation into polar coordinates, but we can simplify further and find something interesting. Try factoring our the r.

$$r^2 \left[cos^2(\theta) + sin^2(\theta)\right] = 9$$

Recall the trig. identity $sin^2\theta + cos^2\theta = 1$. So, we get

$$r^2 = 9$$
$$r = 3$$

Example 2

Convert this equation into polar coordinates

$$3y = x$$

Make the substitutes like we did in example 1.

$$3(rsin(\theta)) = rcos(\theta)$$

Note: the r's cancel out when I divide both sides by r.

$$tan(\theta) = \frac{1}{3}$$
$$\theta = tan^{-1}(\frac{1}{3})$$

This is the polar representation of the original equation. Interpret it like this. For any value of r, $\theta = tan^{-1}(\frac{1}{3})$

❗ Warning: The difference between our results and the work you've done for point conversion is that point conversions give you one θ and r value. For equations, you will either obtain a relationship between θ and r or have an equation with only θ or only r.

Think about the point $(3, 4)$ and the equation $x = 3$