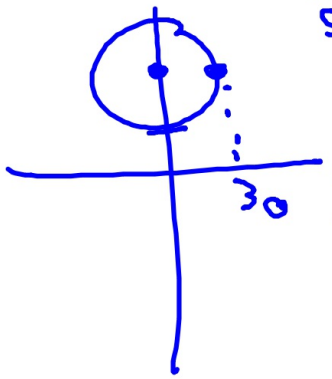
SWBAT understand polar coordinate systems

QUIZ!!!!

Warm - Up

Jane is riding on a Ferris wheel with a radius of 30ft. The wheel is turning coutnerclockwise at the rate of one revolution every 10 sec. Assume the lowest point of the Ferris wheel is 10ft and Jane is horizontal to the center. Find parametric equations to model Jane's path and use them to find Jane's position 22 sec into the ride.



$\frac{2\pi}{10} = \frac{\pi}{5}$

$x = 30\cos\theta t$

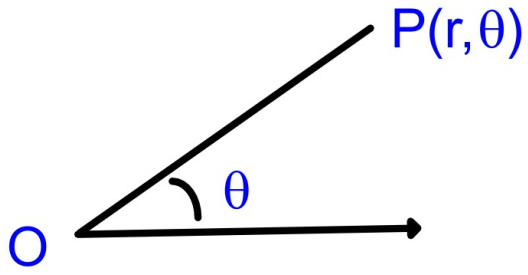
$y = 40 + 30\sin\theta t$

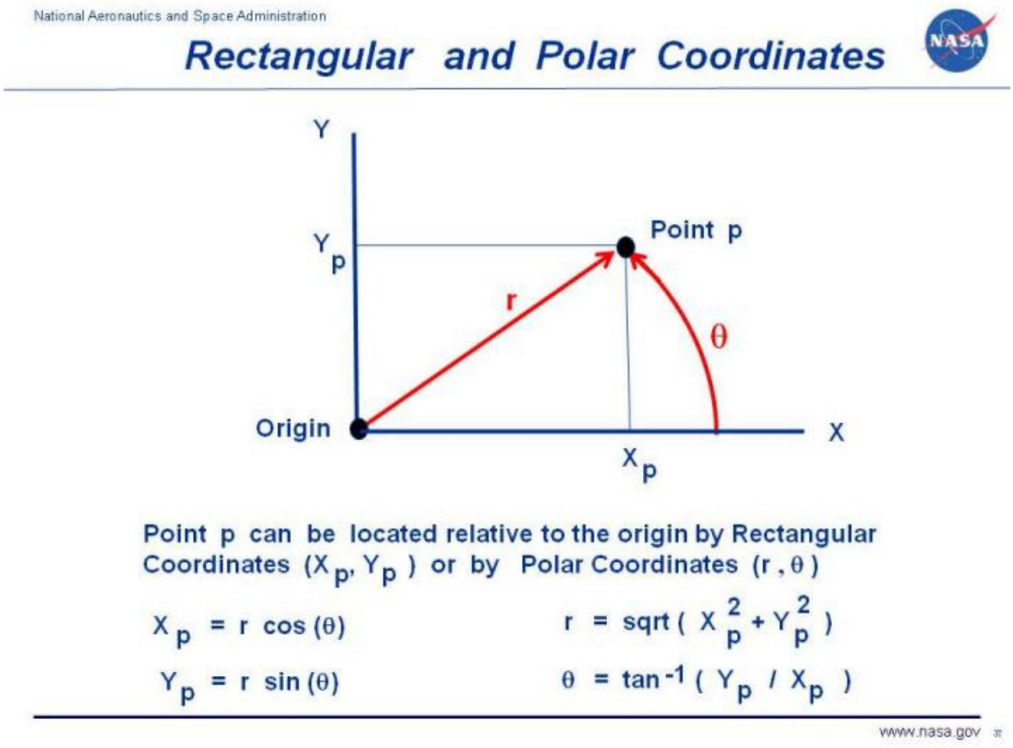
$x = 30\cos\left(\frac{\pi}{5} \cdot 22\right)$

$y = 40 + 30\sin\left(\frac{\pi}{5} \cdot 22\right)$

Polar coordinate system is a plane with a point O, the **pole**, and a ray from O, the **polar axis.**

Each point P in the plane is assigned as **polar coordinates** where r is the **directed distance** from O to P and θ is the **directed angle** whose initial side is on the polar axis and whose terminal side is on ethe line OP.

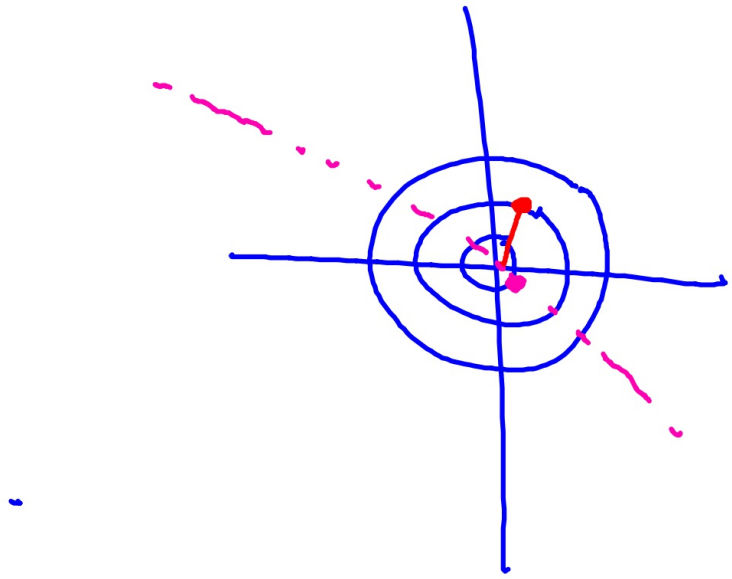




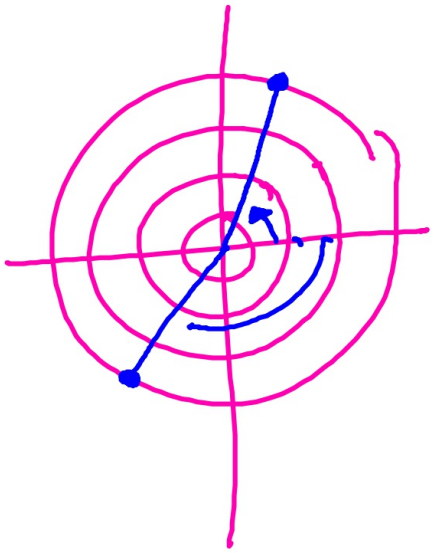
http://www.grc.nasa.gov/WWW/k-12/airplane/coords.html

Plot the point with the given polar coordinates:

P(2, $\pi/3$) Q(-1, $3\pi/4$)



If the point p has polar coordinates (4, $\pi/3$), find all polar coordinates.



$(4, \pi/3)$

$(4, -5\pi/3)$

$(-4, 4\pi/3)$

$(-4, -2\pi/3)$

Let P have polar coordinates (r, θ). Any other polar coordinate of P must be of the form:

$$(r, \theta + 2n\pi) \text{ or } (-r, \theta + (2n+1)\pi)$$

where n is any interger.

Let the point P have polar coordinates (r, θ) and rectangular coordinates (x, y). Then

$$x = r\cos\theta, \qquad r^2 = x^2 + y^2$$
$$y = r\sin\theta, \qquad \tan\theta = y/x$$

Examples:

Find the rectangular coordinates from the polar coordinates:

P(3, 5π/6)

$x = 3\cos\frac{5\pi}{6} \approx -2.59$

$y = 3\sin\frac{5\pi}{6} = 1.5$

Q(2, -200°)

$x \approx -1.87$

$y \approx .68$

Find two polar coordinate pairs for the point given P(-1,1)

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

$r^2 = -1^2 + 1^2$

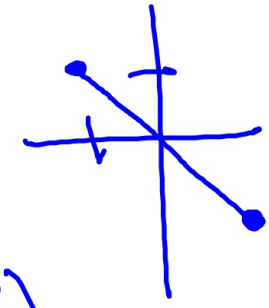
$r^2 = 2$

$r = \sqrt{2}$

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

$\tan\theta = -1$

$\theta = -\frac{\pi}{4}$



$(\sqrt{2}, \frac{3\pi}{4})$

$(-\sqrt{2}, -\frac{\pi}{4})$

Find two polar coordinate pairs for the point given P(-3,0)

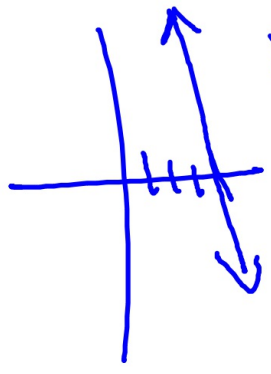
Convert r = 4secθ to rectangular form and identify the graph.

$$\frac{r}{\sec\theta} = \frac{4\sec\theta}{\sec\theta}$$

$$r \cdot \frac{1}{\sec\theta} = 4$$

$$r\cos\theta = 4$$

$$x = 4$$



Convert $(x - 3)^2 + (y - 2)^2 = 13$ to polar form.

$(x-3)(x-3) + (y-2)(y-2) = 13$

$x^2 - 6x + 9 + y^2 - 4y + 4 = 13$

$x^2 + y^2 - 6x - 4y + 13 = 13$

$x^2 + y^2 - 6x - 4y = 0$

$r^2 - 6r\cos\theta - 4r\sin\theta = 0$

$r(r - 6\cos\theta - 4\sin\theta) = 0$

$r = 0$

$r - 6\cos\theta - 4\sin\theta = 0$

$r = 6\cos\theta + 4\sin\theta$

~~Exit Card~~

Convert the rectangular equation to polar form.

$(x - 3)^2 + y^2 = 9$

$(x-3)^2 + y^2 = 9$