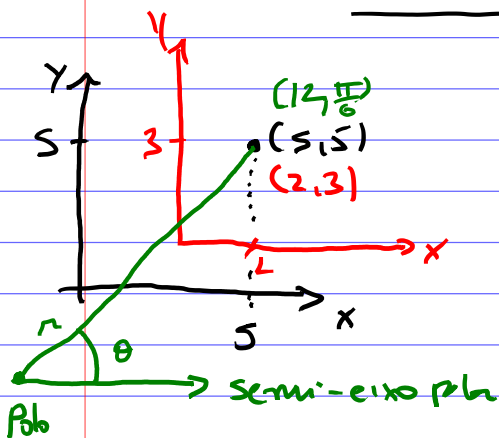
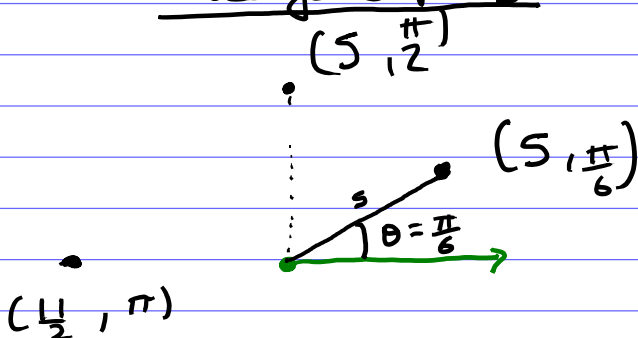


# Sistema de coord. Polares

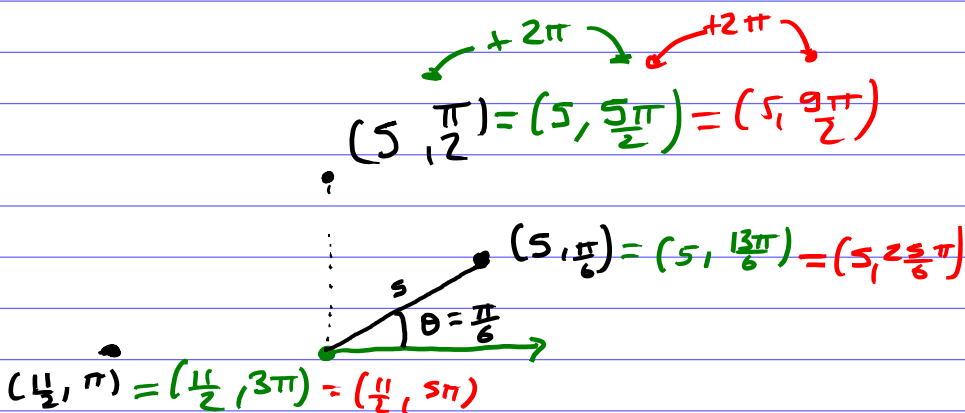


## Localizando Pontos



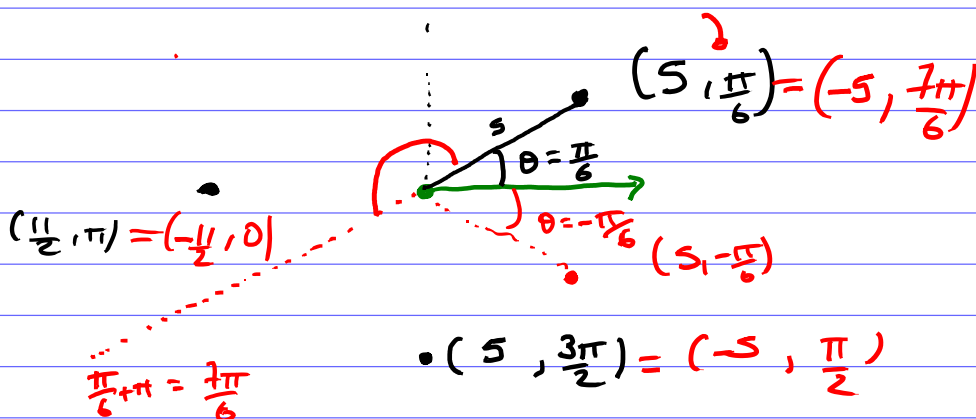
$$\bullet (5, \frac{3\pi}{2})$$

## Multiplicação de coordenadas

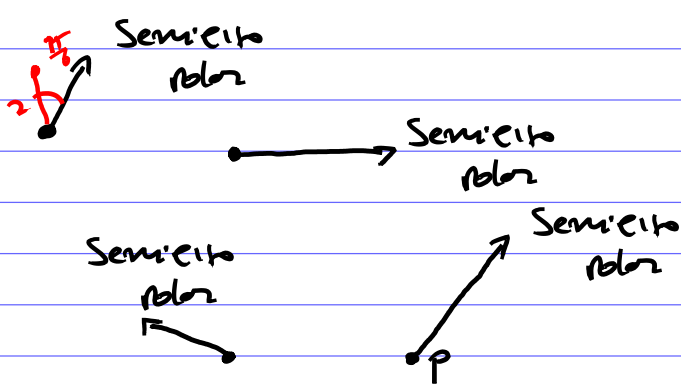


$$\bullet (5, \frac{3\pi}{2}) = (5, \frac{7\pi}{2}) = (5, \frac{11\pi}{2})$$

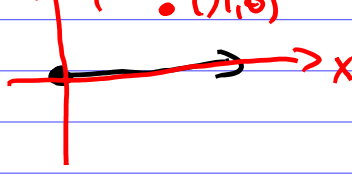
Outra possibilidade



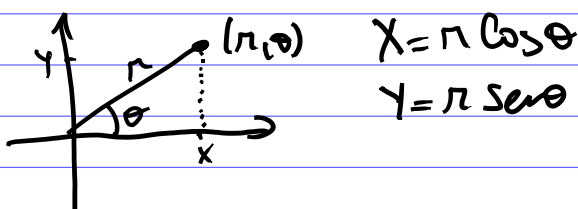
## Conversão



MAS USUAMÉNTA



Polar  $\rightarrow$  Cartesiana



Cartesiana  $\rightarrow$  Polar

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

$$r = \sqrt{x^2 + y^2}$$

$$\tan \theta = \frac{y}{x} \therefore \theta = \arctan\left(\frac{y}{x}\right)$$

Cuidado com esse triângulo

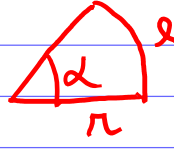
Como eu sei que um por este em coordenadas polares?

$(2, 2)$   $(2, \pi)$   $(2, \frac{\pi}{2})$

$(5, 5)$ .

Resposta: TEM QUE SER DIVIDIDO!

$(2, 2\pi)$



Equações

$$\alpha = \frac{r}{n}$$

se  $r = n$

$$\alpha = \frac{r}{r} = 1$$

$$\alpha = 1 \text{ rad}$$

## Exercícios

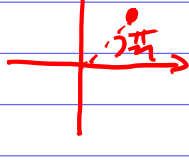
1. Converta P/ coordenadas cartesianas.

a)  $(5, \frac{\pi}{4})$

$$x = 5 \cos \frac{\pi}{4} \quad y = 5 \sin \frac{\pi}{4}$$

$$x = \frac{5\sqrt{2}}{2}, \quad y = \frac{5\sqrt{2}}{2}$$

$$\left(\frac{5\sqrt{2}}{2}, \frac{5\sqrt{2}}{2}\right)$$

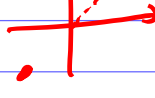


b)  $(-5, \frac{\pi}{4})$

$$x = -5 \cos \frac{\pi}{4} \quad y = -5 \sin \frac{\pi}{4}$$

$$x = -\frac{5\sqrt{2}}{2}, \quad y = -\frac{5\sqrt{2}}{2}$$

$$\left(-\frac{5\sqrt{2}}{2}, -\frac{5\sqrt{2}}{2}\right)$$

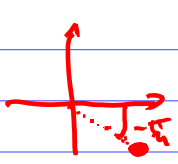


c)  $(5, -\frac{\pi}{4})$

$$x = 5 \cos(-\frac{\pi}{4}) \quad y = 5 \sin(-\frac{\pi}{4})$$

$$x = \frac{5\sqrt{2}}{2}, \quad y = -\frac{5\sqrt{2}}{2}$$

$$\left(\frac{5\sqrt{2}}{2}, -\frac{5\sqrt{2}}{2}\right)$$

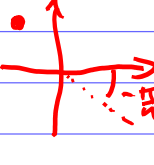


d)  $(-5, -\frac{\pi}{4})$

$$x = -5 \cos(-\frac{\pi}{4}) \quad y = -5 \sin(-\frac{\pi}{4})$$

$$x = -\frac{5\sqrt{2}}{2}, \quad y = \frac{5\sqrt{2}}{2}$$

$$\left(-\frac{5\sqrt{2}}{2}, \frac{5\sqrt{2}}{2}\right)$$



## Converta P/ Coordenadas Polares

a)  $(-5, 5)$

Vamos usar a fórmula:  $r = \sqrt{x^2 + y^2}$

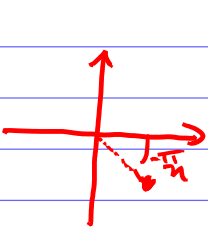
$$r = \sqrt{25 + 25}$$

$$r = 2\sqrt{5}$$

$$\theta = \arctan\left(\frac{y}{x}\right) = \arctan(-1) = -\frac{\pi}{4}$$

De acordo com fórmula:

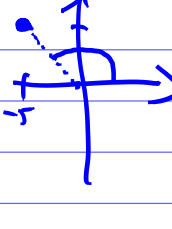
$$\left(2\sqrt{5}, -\frac{\pi}{4}\right)$$



esse ponto tá no 2º quadrante. MAS O ponto  $(-5, 5)$  tá no 2º quadrante.

Usar a fórmula na função a respeito cartes!!!

Melhor jeito de proceder:



$$r = \sqrt{x^2 + y^2}$$

$$r = \sqrt{25 + 25}$$

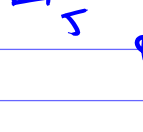
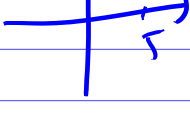
$$r = 2\sqrt{5}$$

$$\theta = \frac{\pi}{2} + \frac{\pi}{4} = \frac{2\pi + \pi}{4} = \frac{3\pi}{4}$$

$$\left(2\sqrt{5}, \frac{3\pi}{4}\right)$$

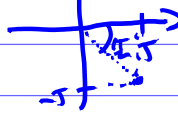
b)  $(5, 5)$

$$\left(2\sqrt{5}, \frac{\pi}{4}\right)$$



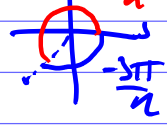
$$\theta = \frac{\pi}{4}$$

c)  $(5, -5)$



$$\left(2\sqrt{5}, -\frac{\pi}{4}\right)$$

d)  $(-5, -5)$



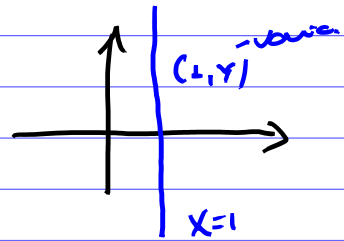
$$\left(2\sqrt{5}, \pi + \frac{\pi}{4}\right)$$

$$\left(2\sqrt{5}, \frac{5\pi}{4}\right)$$

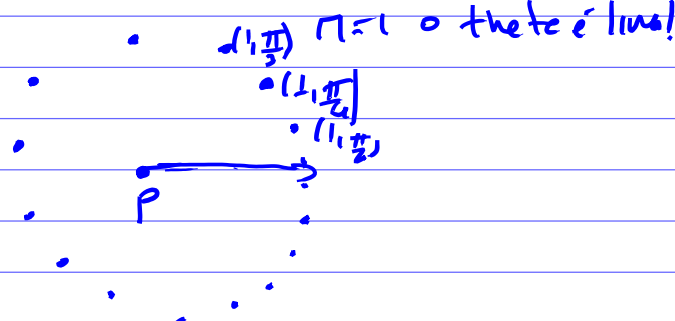
$$\left(2\sqrt{5}, -\frac{3\pi}{4}\right)$$

# Eg. Em coordenadas polares

$X=1$  { 1D é ponto  
2D é reta  
3D é plano

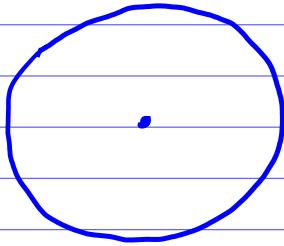


$r=1$  — Em Polar é:

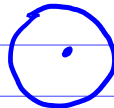


$r=1$  em coordenadas polares  
é eq de um círculo  
Centro no orig.

$r=2$



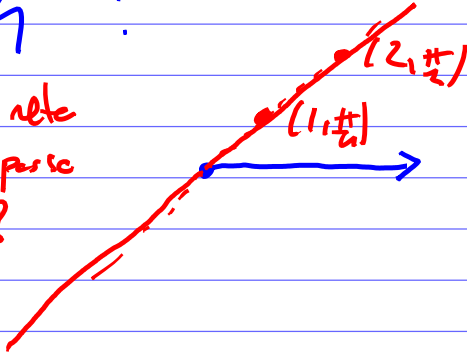
$r=1/2$



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

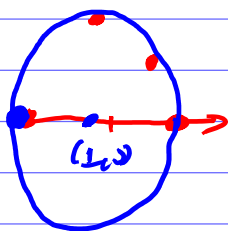
$r$  é line

Em uma reta  
que passa  
no orig?



$$\rho = 2 \cos \theta$$

$\theta$	$\rho$
0	2
$\frac{\pi}{6}$	$\sqrt{3}$
$\frac{\pi}{4}$	$\sqrt{2}$
$\frac{\pi}{3}$	1
$\frac{\pi}{2}$	0



$$\rho = 2 \cos \theta$$

$$\rho^2 = 2 \rho \cos \theta$$

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

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

$$x^2 - 2x + 1 - 1 + y^2 = 0$$

$$(x - 1)^2 + y^2 = 1$$

É a eq. de um círculo de  
raio 1 e centro de  
em (1, 0)

Eq. de um círculo

$$(x - x_0)^2 + (y - y_0)^2 = R^2$$

centro de em  $(x_0, y_0)$   
e de raio  $R$ .