Starter 5/8

① graph the point (-3,4).

② What Quadrant is the point in?

③ What do the -3 and 4 represent?

④ Draw in the triangle for the above point and find the length of the hypotenuse.

Polar Coordinates

(r, θ) — r: radius, θ: angle

+r : start in positive x-axis direction

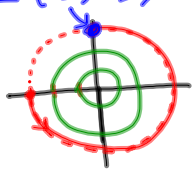
-r : start in negative x-axis direction

+θ : move counter-clockwise

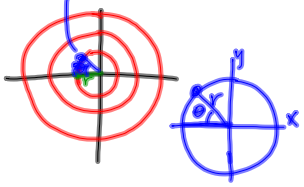
-θ : move clockwise

ex: $P=(3, \frac{\pi}{4})$

ex: $(-3, \frac{3\pi}{2})$



ex: $(-1, -\frac{\pi}{4})$

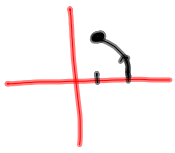


ex: $(2, 135°)$

Find other representations:

- add/subtract 2π from θ
- change sign of r and add/subtr. π from θ

ex: find 3 other representations for $(2, \frac{\pi}{3})$



$\frac{\pi}{3} + 2\pi = \frac{\pi}{3} + \frac{6\pi}{3} = \frac{7\pi}{3}$

$\boxed{(2, \frac{7\pi}{3})}$

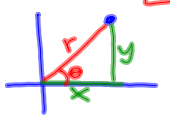
$\frac{\pi}{3} - \pi = \frac{\pi}{3} - \frac{3\pi}{3} = -\frac{2\pi}{3}$

$\boxed{(-2, -\frac{2\pi}{3})}$

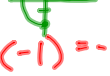
Converting between Polar and rectangular

$\sin\theta = \frac{y}{r} \rightarrow y = r\sin\theta$ $\quad x^2+y^2=r^2$

$\cos\theta = \frac{x}{r} \rightarrow x = r\cos\theta$ $\quad \tan\theta = \frac{y}{x}$



ex: convert to rectangular: $(2, \frac{3\pi}{2})$ (r, θ)



$y = 2\sin\frac{3\pi}{2} = 2(-1) = -2$

$x = 2\cos\frac{3\pi}{2} = 2(0) = 0$

$\boxed{(0, -2)}$

ex: convert to polar: $(-1, \sqrt{3})$ (x, y)

step 1: graph

step 2: find r

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

$(-1)^2+(\sqrt{3})^2=r^2$

$1+3=r^2$

$4=r^2$

$2=r$

step 3: find θ

$\tan\theta = \frac{\sqrt{3}}{-1}$

$\tan\theta = -\sqrt{3}$

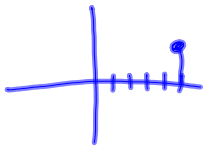
$\theta = \frac{2\pi}{3}$

$\boxed{(2, \frac{2\pi}{3})}$

homework:

p. 655 #1-11, 13, 17, 20, (21), 23, 26-28, 33-37, 41-46

(21) $(5, \frac{\pi}{6})$



a) $\frac{\pi}{6} + 2\pi = \frac{\pi}{6} + \frac{12\pi}{6} = \frac{13\pi}{6}$

$\left(5, \frac{13\pi}{6}\right)$

b) $\frac{\pi}{6} + \pi = \frac{\pi}{6} + \frac{6\pi}{6} = \frac{7\pi}{6}$

$\left(-5, \frac{7\pi}{6}\right)$

c) $\frac{\pi}{6} - \frac{12\pi}{6} = -\frac{11\pi}{6}$

$\left(5, -\frac{11\pi}{6}\right)$