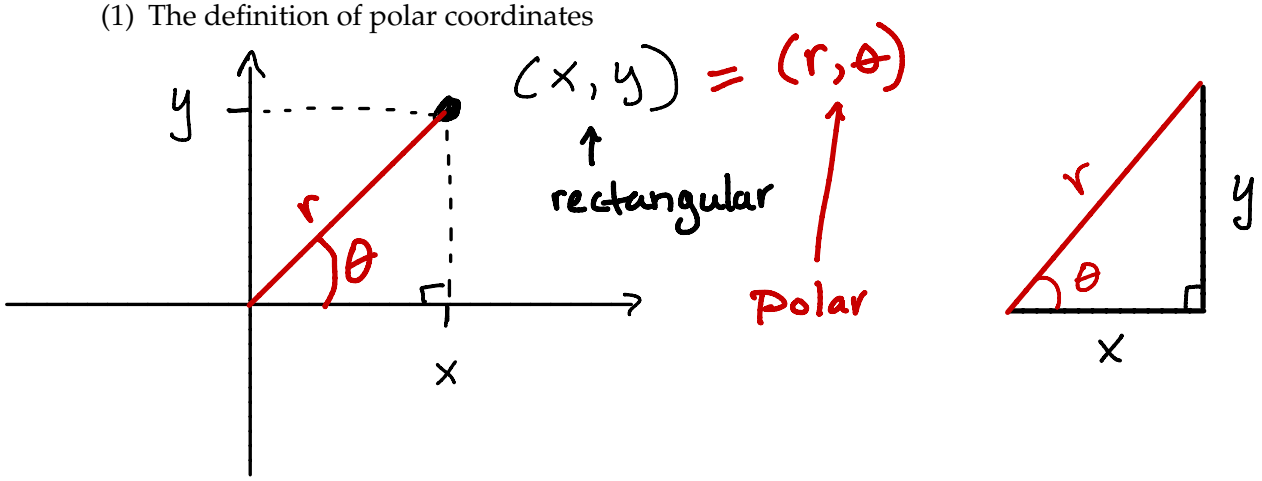
SECTION 7.3: POLAR COORDINATES (DAY 1)

(1) The definition of polar coordinates



Conversion formulas

$\sin\theta = \frac{y}{r}$, $\cos(\theta) = \frac{x}{r}$

or

$y = r\sin\theta$

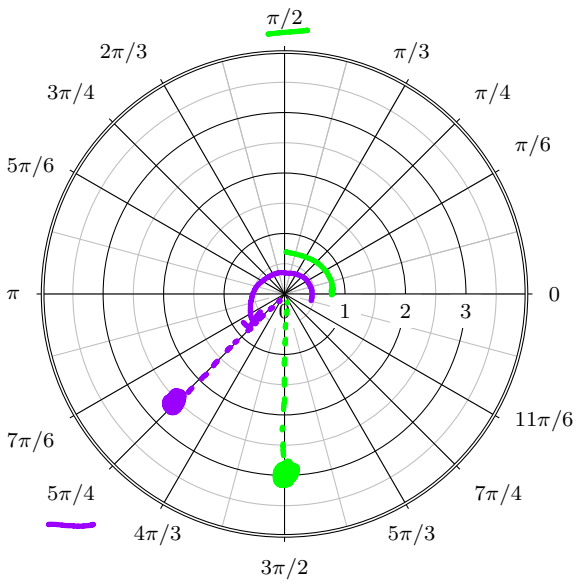
$x = r\cos\theta$

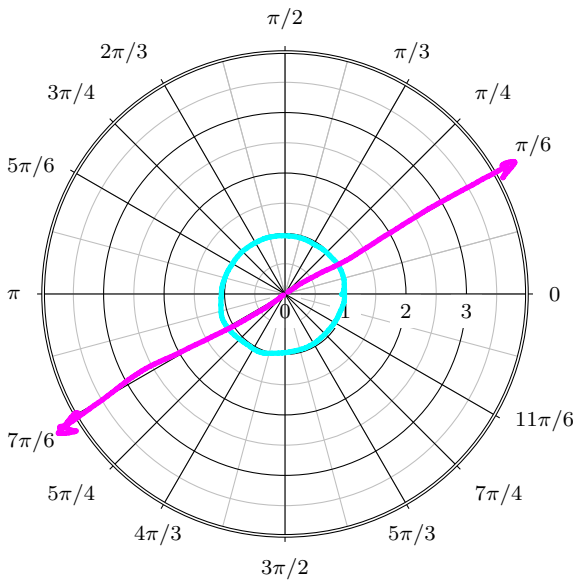
$x^2 + y^2 = r^2$

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

Find other coordinates for P and Q: $P(2.5, 3\pi/4)$ $Q(3, \frac{3\pi}{2})$

(2) In the polar grids below, graph the points $P = (2.5, 5\pi/4)$, $Q = (-3, \pi/2)$, $r = 1$, and $\theta = \pi/6$.





Convert P and Q into rectangular

Point P $(2.5, \frac{5\pi}{4})$ in polar is $\left(\frac{-2.5\sqrt{2}}{2}, \frac{-2.5\sqrt{2}}{2}\right)$ in rectangular.

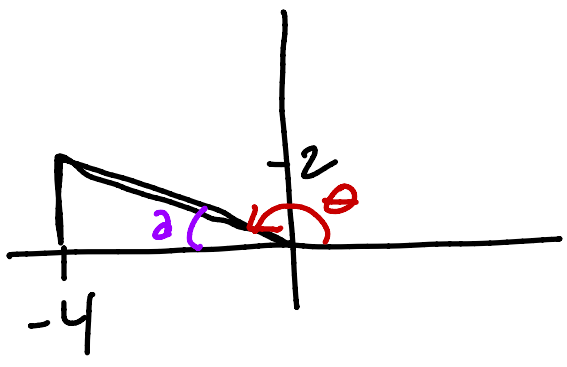
$x = 2.5\cos\left(\frac{5\pi}{4}\right) = 2.5\left(\frac{-\sqrt{2}}{2}\right)$

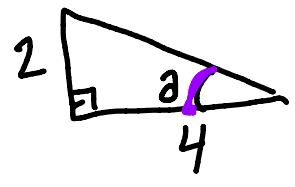
$y = 2.5\sin\left(\frac{5\pi}{4}\right) = 2.5\left(\frac{-\sqrt{2}}{2}\right)$

$Q\left(-3, \frac{\pi}{2}\right)$ in polar is $(0, -3)$ in rectangular.

Convert the point $(-4, 2)$ in rectangular coordinates to polar coordinates.

$r = \sqrt{2^2 + (-4)^2} = \sqrt{20} = 2\sqrt{5}$





$a = \frac{\pi}{6}$ $\quad \theta = \frac{5\pi}{6}$

Ans: $\left(2\sqrt{5}, \frac{5\pi}{6}\right)$

Note:

$\tan\theta = \frac{2}{-4} = -\frac{1}{2}$. $\quad \arctan\left(-\frac{1}{2}\right) = -\frac{\pi}{6}$