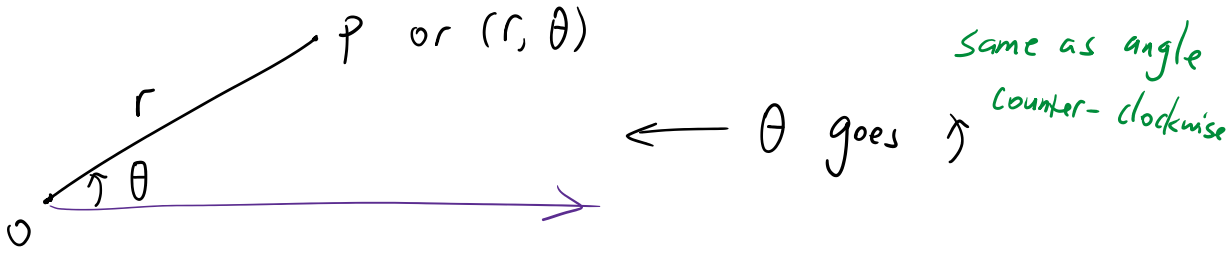
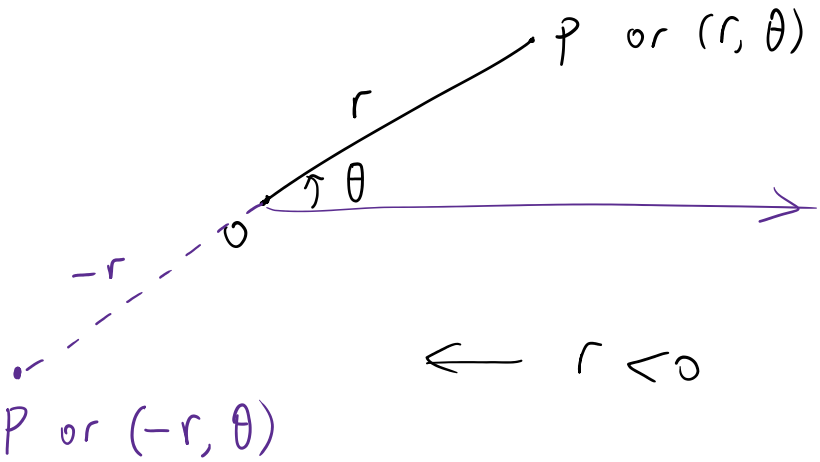
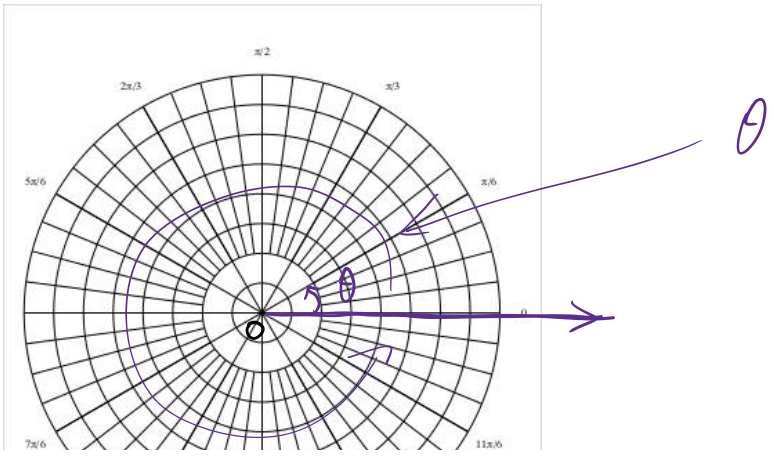
III. Polar Coordinate (r, θ)

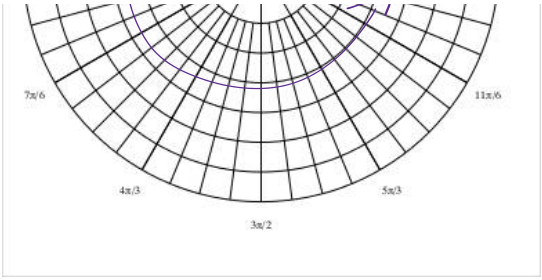
For polar coordinates, we have r (radius) is the distance from O to P, which O is the polar (origin) and O to the line P is called polar axis.



Also,

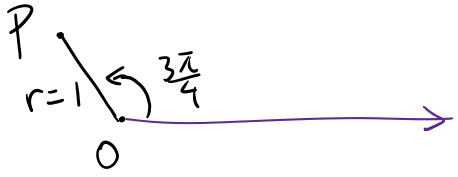






eg. Plot $(1, \frac{3\pi}{4})$. ← (r, θ)

Sol:

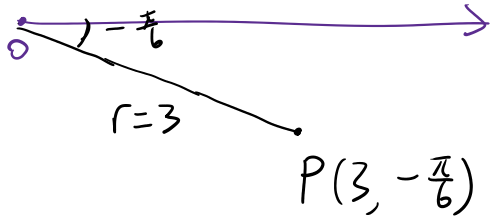


← polar axis

$\frac{3\pi}{4} = 135°$

eg. Plot $P(3, -\frac{\pi}{6})$. ← it comes with P for polar coordinate notation

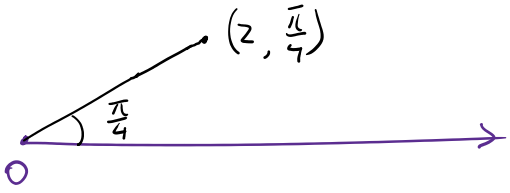
Sol:



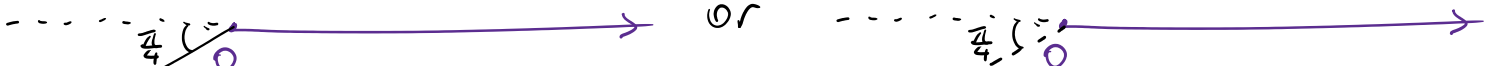
$-\frac{\pi}{6} = -30°$

eg. Plot $P(-2, \frac{\pi}{4})$.

Sol: First, plot $P(2, \frac{\pi}{4})$



$\frac{\pi}{4} = 45°$



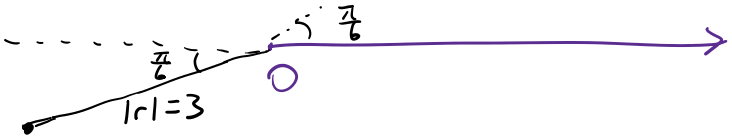
$P(-2, \frac{\pi}{4})$

or

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

eg. Plot $P(-3, \frac{\pi}{6})$.

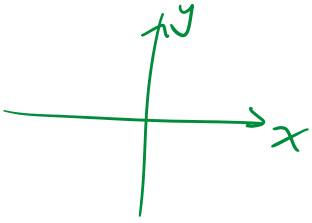
Sol:

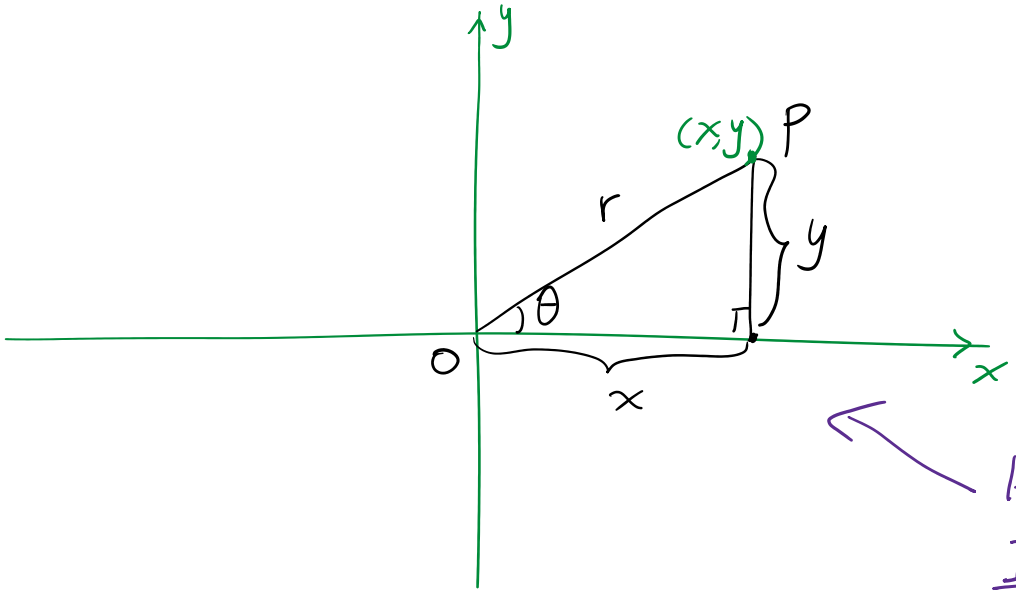


$P(-3, \frac{\pi}{6})$

$\frac{\pi}{6} = 30°$

IV. Polar and Rectangular Translation





If you forget? Draw this!

We have $\sin\theta = \frac{y}{r}$, $\cos\theta = \frac{x}{r}$, $\tan\theta = \frac{y}{x}$

$r \cdot \sin\theta = \frac{y}{r} \cdot r$ $r \cdot \cos\theta = \frac{x}{r} \cdot r$ $\tan^{-1}\tan\theta = \tan^{-1}\frac{y}{x}$

$r\sin\theta = y$, $r\cos\theta = x$ $\theta = \tan^{-1}\frac{y}{x}$

and $r^2 = x^2 + y^2$, by the Pythagorean Thm.

then $\sqrt{\quad}$ $\sqrt{\quad}$

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

Thus, $\boxed{x = r\cos\theta, \quad y = r\sin\theta}$ $\leftarrow (x, y)$

$\boxed{r = \sqrt{x^2 + y^2}, \quad \theta = \tan^{-1}\frac{y}{x}}$ $\leftarrow (r, \theta)$

That's the completed translation.