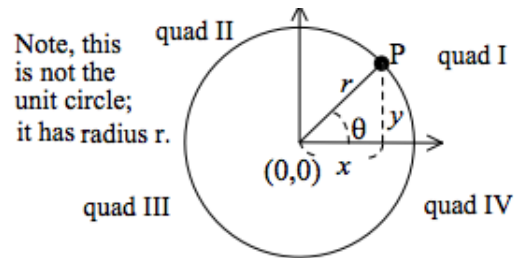Sections 8.5 Lecture Notes

Definition: The *polar coordinates* (r, θ) of a point P are its distance r (radius) from the origin and the angle θ between the positive x-axis and the line from $(0,0)$ to P. The usual (x, y) are called the *rectangular (or cartesian) coordinates*.

Example: Plot the polar coordinates $\left(1, \frac{\pi}{4}\right)$ and $\left(2, -\frac{\pi}{2}\right)$

Brainstorm: What do you think a negative radius means? In other words, how would you plot a point that looks like $(-r, \theta)$?

Example: Graph $(-3, 150°)$

Brainstorm: What equations relate rectangular coordinates x and y to polar coordinates r and θ? How can we use the equations to convert between the two?

Examples:

(1) Convert $\left(7, \frac{\pi}{6}\right)$ from polar coordinates to rectangular coordinates.

(2) Convert $(-1, \sqrt{3})$ from rectangular coordinates to polar.

(3) Convert the polar equation to a rectangular equation: $r\sin\theta + 2\cos\theta = 0$

(4) Convert the rectangular equation to a polar equation: $2x - y^2 = 0$