Review of curves defined using polar coordinates

Associated to any pair of numbers \((r, \theta)\) is a point in the plane determined as follows:

With polar coordinates, we allow negative \(r\), which sometimes produces unexpected results (as we shall see).

Basic graphs:

**Example 1.** \(r = 3\)

**Example 2.** \(\theta = \pi/4\)
Let’s do two more examples that are a little more complicated.

Example 3. \( r = 3 \cos \theta \)

Example 4. \( r = \cos 2\theta \)
In this course, polar coordinates are used to describe curves, regions, and functions that have a lot of radial symmetry, and we need to be able to convert from rectangular coordinates to polar coordinates and vice versa. The conversion formulas all come from trigonometry.

**Example 3 revisited.** How can we convert $r = 3 \cos \theta$ to rectangular coordinates?
Example 5. \( r = 1 + 2 \cos \theta \)