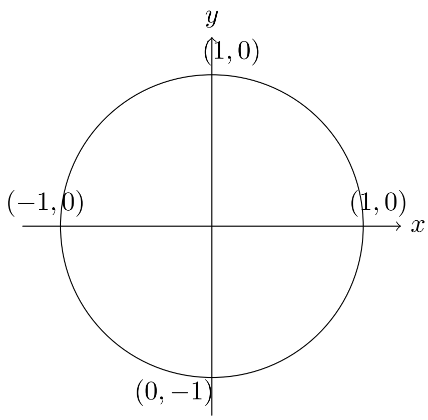
- The unit circle is a circle in $x - y$ plane, with center at the origin and radius 1.



- The equation of the unit circle is $x^2 + y^2 = 1$. By this we mean if a point (x, y) on the plane has property $x^2 + y^2 = 1$, then the point is on the circle, and all points (x, y) on the circle have the property

$$x^2 + y^2 = 1$$

Example 0.1. .

  - Which one of the following points are on the unit circle?
    $A : (1, 1)$ $B : (\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$ $C : (1, 0)$ $D : (0, 0)$
    $E : (\frac{1}{\sqrt{3}}, -\frac{\sqrt{2}}{\sqrt{3}})$
  - The point $(x, -.3)$ is on the unit circle. Find x.

- We can assign to each point on the real line an angle; each real number corresponds to a point on the unit circle. We wrap the real line around the unit circle as follows

  - fix 0 on the point $(1, 0)$.
  - The positive real line (numbers) wrap counter clockwise
  - The negative real numbers wrap clockwise.

Example 0.2. Find (x, y) on the unit circle that corresponds to the following points:
$0,$ $\pi/2,$ $\pi,$ $3\pi/2$

$-5\pi/4$ $\quad 2\pi \quad 3\pi \quad -3\pi/4.$

- Trig functions on the real line: Let t be a real number. To find $\sin t$, we find its corresponding point (x, y) on the unit circle by wrapping the real line around the unit circle. Then

$$\sin t = y, \qquad \cos t = x$$

$$\tan t = y/x, \qquad \cot t = y/x$$

$$\sec t = 1/x, \qquad \csc t = 1/y$$

- Note that how points t and $t \pm 2k\pi$ gets mapped on the unit circle

1 Domain and period of the $\sin$ and $\cos$ functions

- Adding 2π to each value of t in the interval $[0, 2\pi]$ does not effect the value of the trig functions $\sin t$, $\cos t$, $\sec t$, $\csc t$, $\tan t$, $\cot t$.

2 Even and odd trig functions