

## Math 150 Lecture Notes

### The Unit Circle

The **unit circle** is the circle of radius 1 centered at the origin in the  $xy$ -plane. Its equation is  $x^2 + y^2 = 1$ .

If a distance  $t > 0$  is marked along the unit circle, starting at  $(1, 0)$  and moving in a counterclockwise direction, the arrival point is called the **terminal point**.

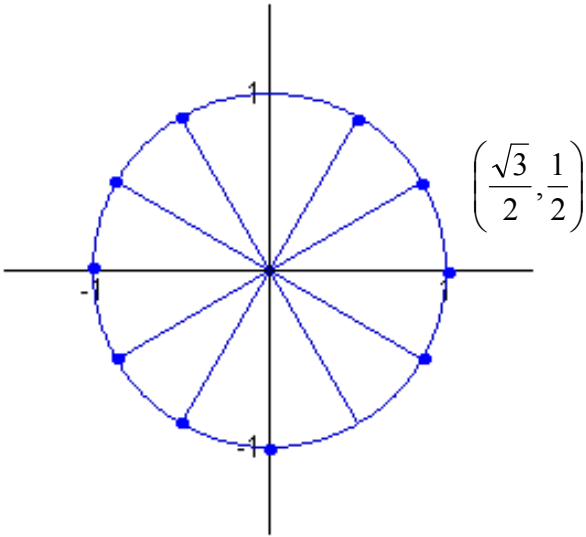
The **reference number** associated with a real number,  $t$ , is the shortest distance along the unit circle between the terminal point determined by  $t$  and the  $x$ -axis.

Example 1: Show that the point  $\left(-\frac{5}{7}, -\frac{2\sqrt{6}}{7}\right)$  is on the unit circle.

Example 2: Given that  $P$  is on the unit circle, find the missing coordinate of  $P\left(-\frac{2}{3}, \quad\right)$  in quadrant II.

Example 3: Find  $P$  given that the  $x$ -coordinate of  $P$  is positive and the  $y$ -coordinate of  $P$  is  $-\frac{\sqrt{5}}{5}$ .

Example 4: Find  $t$  and the terminal point determined by  $t$  ( $t$  increases in increments of  $\pi/6$ ) for each point in the figure.



Example 5: Find the terminal point  $P(x, y)$  on the unit circle determine by  $t = -\frac{\pi}{2}$ .

Example 6: Find the reference number for  $t = \frac{11\pi}{5}$  and for  $t = -\frac{9\pi}{7}$ .