

# Math 142 Pre-Calc II Notes

## 5.1 The Unit Circle

**Objectives:** Find coordinates of terminal points on the unit circle; use reference numbers.

The Unit Circle is a circle centered at the origin with radius 1. The equation of the unit circle is:

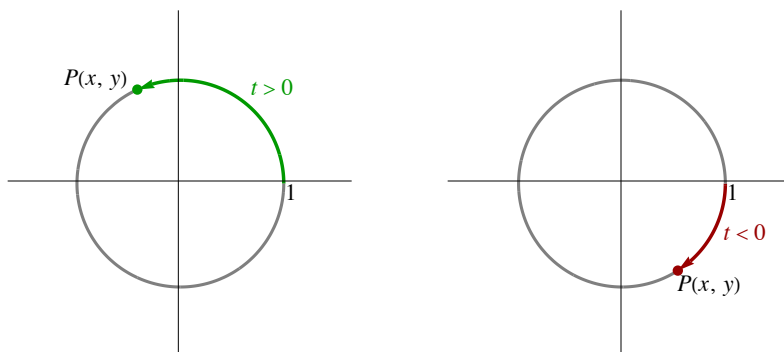
$$x^2 + y^2 = 1$$

**Example 1** Show that the point  $\left(-\frac{\sqrt{6}}{3}, \frac{\sqrt{3}}{3}\right)$  is a point on the unit circle.

**Example 2** If  $\left(\frac{1}{2}, y\right)$  is a point in quadrant IV on the unit circle. Find  $y$ .

### Terminal Points on the Unit Circle

Suppose  $t$  is a real number. If we mark off a length of  $t$  on the unit circle we get a *terminal point* on the circle.



**Example 3** Find the terminal point for each real number:

(a)  $t = \frac{\pi}{2}$

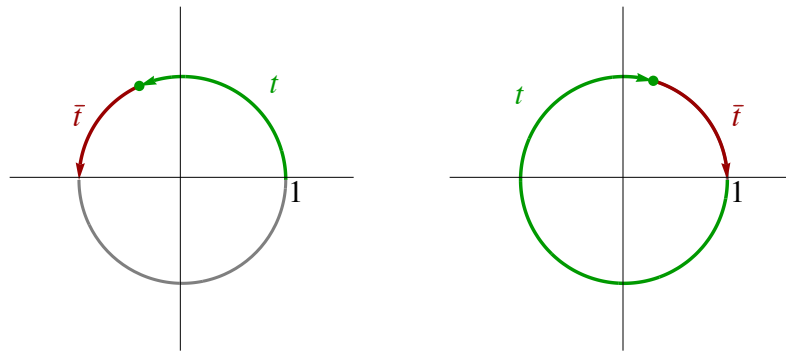
(b)  $t = \pi$

(c)  $t = -3\pi$

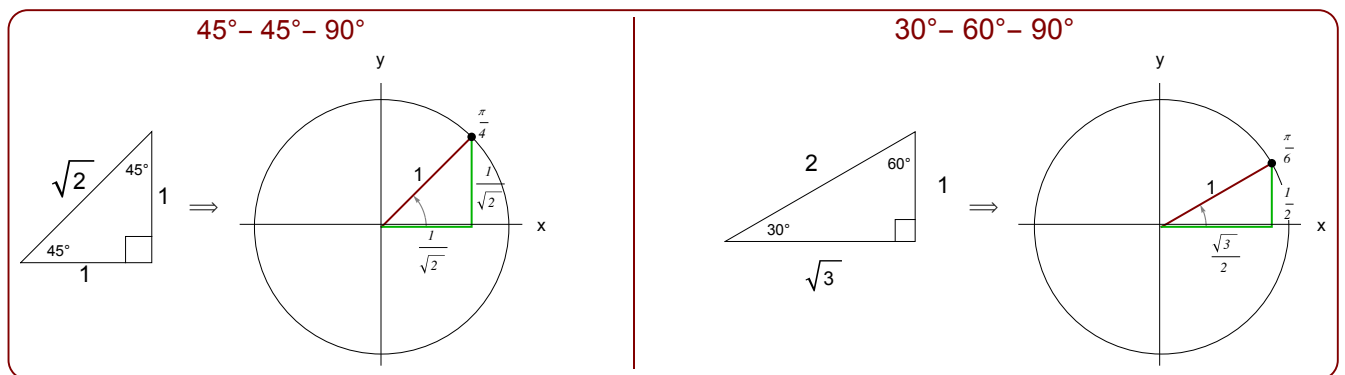
(d)  $t = \frac{\pi}{4}$

## Reference Numbers

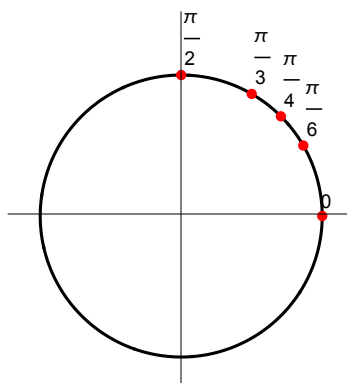
A *reference number*,  $\bar{t}$ , for the number  $t$  is the shortest distance along the unit circle to the  $x$ -axis regardless of direction.



Two triangles that will give additional “nice” exact values are a  $45^\circ$ - $45^\circ$ - $90^\circ$  triangle, ( $t = \frac{\pi}{4}$ ), and a  $30^\circ$ - $60^\circ$ - $90^\circ$  triangle, ( $t = \frac{\pi}{6}$  and  $t = \frac{\pi}{3}$ ):



**Example 4** Find the coordinates for each terminal point on the unit circle:



**Example 5** Find the coordinates of the terminal point for:

- (a)  $t = -\frac{5\pi}{4}$       (b)  $t = \frac{5\pi}{6}$       (c)  $t = \frac{-\pi}{3}$       (d)  $\frac{11\pi}{2}$