5.1 Part 2 Using the Unit Circle

Example 1

Show that point P($\frac{\sqrt{3}}{3}$, $\frac{\sqrt{2}}{\sqrt{3}}$) is on the unit circle.

$x^2 + y^2 = 1$

$\left(\frac{\sqrt{3}}{3}\right)^2 + \left(\frac{\sqrt{2}}{\sqrt{3}}\right)^2 \stackrel{?}{=} 1$

$\frac{3}{9} + \frac{2}{3} \stackrel{?}{=} 1$

$\frac{1}{3} + \frac{2}{3} = 1$ ✓

Example 2

The point P($\frac{\sqrt{3}}{2}$, y) is on the unit circle in quadrant IV. Find it's y-coordinate.

$x^2 + y^2 = 1$

$\left(\frac{\sqrt{3}}{2}\right)^2 + y^2 = 1$

$\frac{3}{4} + y^2 = 1$

$\sqrt{y^2} = \sqrt{\frac{1}{4}}$

$y = \pm\frac{1}{2}$

$y = -\frac{1}{2}$

The reference number , $\bar{t}$, is the shortest distance along the unit circle between the terminal point and the x-axis.

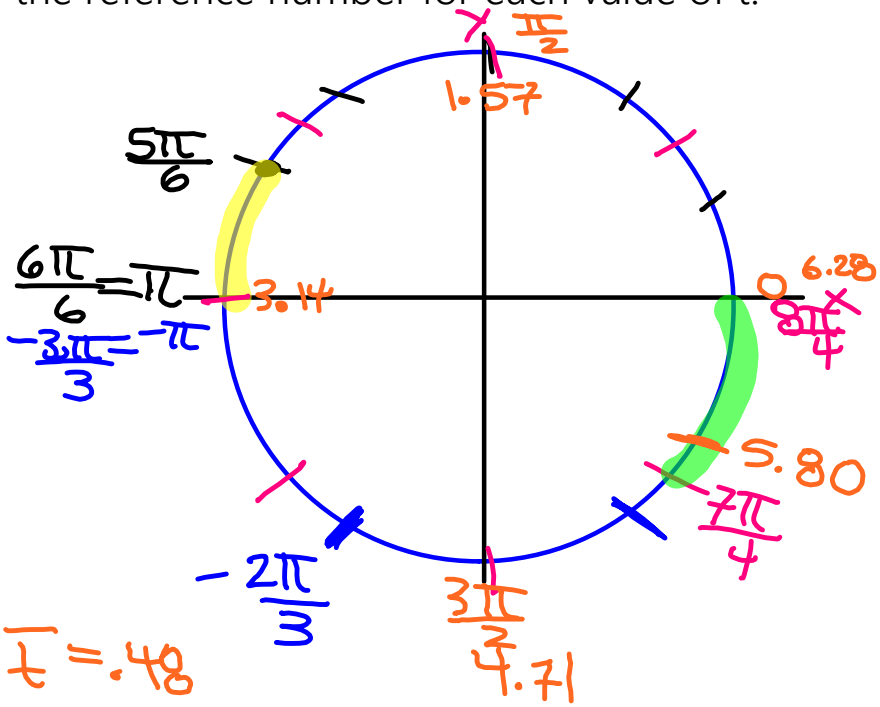
Example 3: Find the reference number for each value of t.

a) $t = \frac{5\pi}{6}$ $\bar{t} = \frac{\pi}{6}$

b) $t = \frac{7\pi}{4}$ $\bar{t} = \frac{\pi}{4}$

c) $t = -\frac{2\pi}{3}$ $\bar{t} = \frac{\pi}{3}$

d) $t = 5.80$ $\bar{t} = .48$



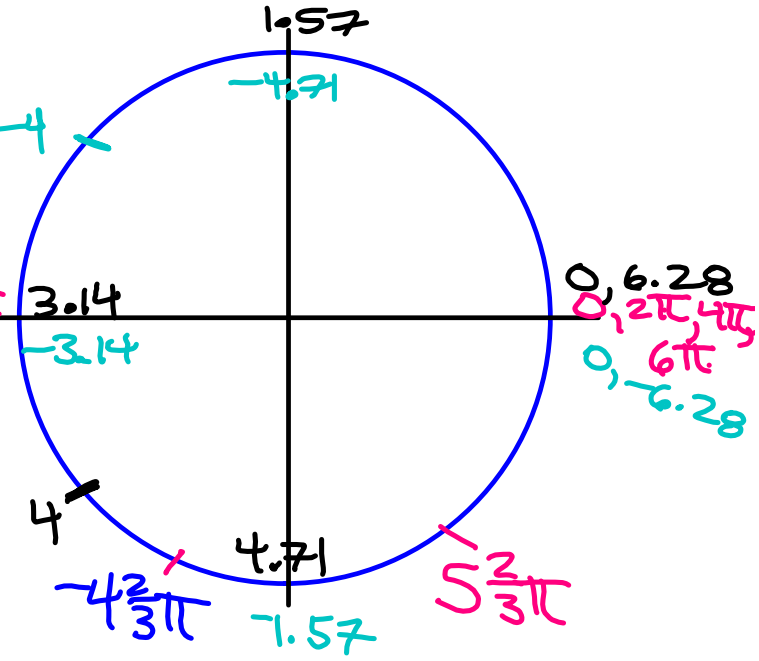
Example 4: Find the reference number for each value of t.

a) $t = \frac{17\pi}{3}$ $= 5\frac{2}{3}\pi$ $\bar{t} = \frac{\pi}{3}$

b) $t = -\frac{14\pi}{3}$ $-4\frac{2}{3}\pi$ $5\pi, 3\pi, \pi$ $\bar{t} = \frac{\pi}{3}$

c) $t = 4$ $\bar{t} = .86$

d) $t = -4$ $\bar{t} = .86$



To find the terminal point P determined by any value of t, use the following steps:

1) Find the reference number.
2) Find the terminal point of the reference number.
3) Determine the signs of the terminal point based on the quadrant it lies in.

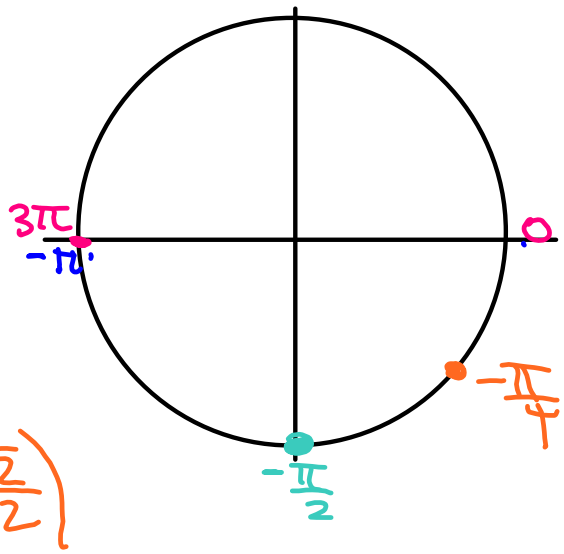
Example 5: Find the terminal point on the unit circle determined by each real number.

a) $t = 3\pi$ $(-1, 0)$

b) $t = -\pi$ $(-1, 0)$

c) $t = -\frac{\pi}{2}$ $(0, -1)$

d) $t = -\frac{\pi}{4}$ $\left(\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$



Example 6: Find the terminal point on the unit circle determined by each real number.

a) $t = \frac{3\pi}{4}$ $\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$

b) $t = -\frac{5\pi}{4}$ $\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$

c) $t = \frac{5\pi}{6}$ $\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$

d) $t = \frac{7\pi}{4}$ $\left(\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$

e) $t = \frac{29\pi}{6}$ $\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$