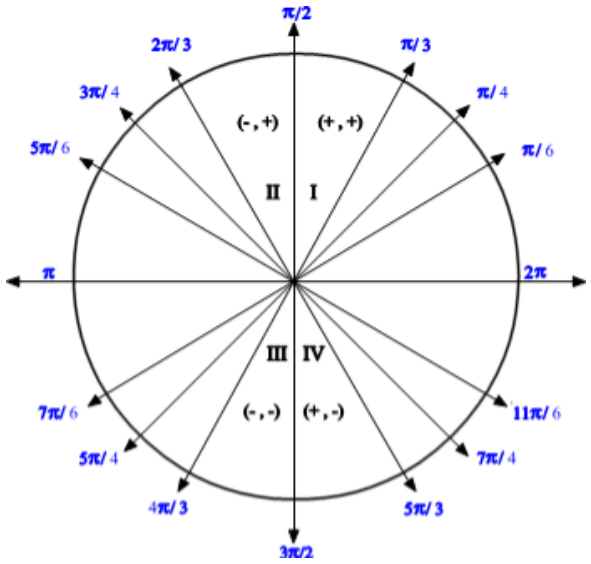
Section 5.1 - The Unit Circle

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

Points on the Unit Circle - the sum of the squares of each co-ordinate is 1.

Terminal points on the unit circle

-ordered pairs that are on the circle


π/2
2π/3
π/3
3π/4
π/4
5π/6
π/6
(-, +)
(+, +)
II
I
π
2π
III
IV
(-, -)
(+, -)
7π/6
11π/6
5π/4
7π/4
4π/3
5π/3
3π/2

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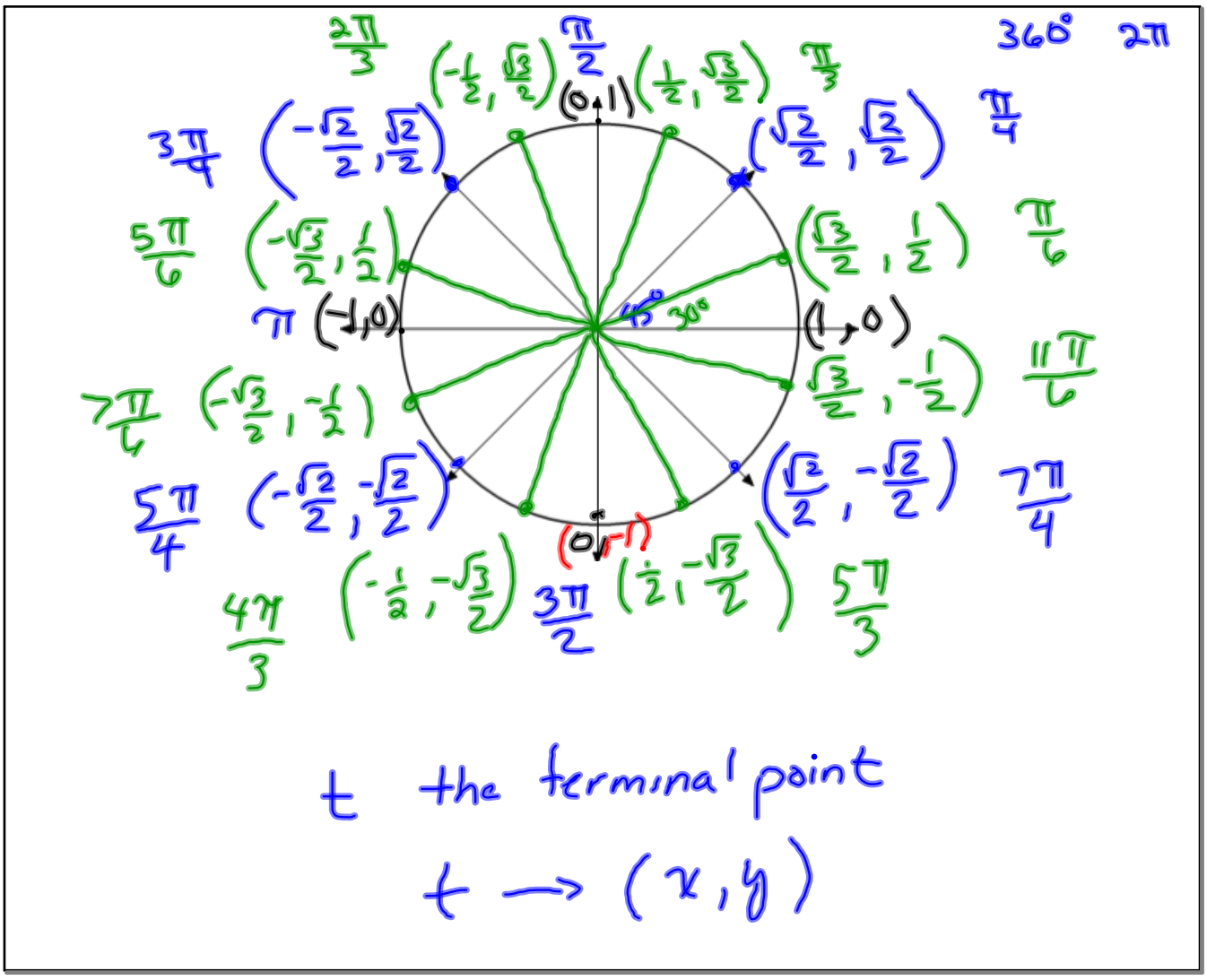
360°
2π
2π/3
π/2
π/3
π/4
3π/4
5π/6
π/6
π
(-1,0)
(1,0)
45°
30°
7π/6
11π/6
5π/4
7π/4
4π/3
3π/2
5π/3
(0,1)
(0,-1)
(-1/2, √3/2)
(1/2, √3/2)
(-√2/2, √2/2)
(√2/2, √2/2)
(-√3/2, 1/2)
(√3/2, 1/2)
(-√3/2, -1/2)
(√3/2, -1/2)
(-√2/2, -√2/2)
(√2/2, -√2/2)
(-1/2, -√3/2)
(1/2, -√3/2)
t the terminal point
t → (x, y)

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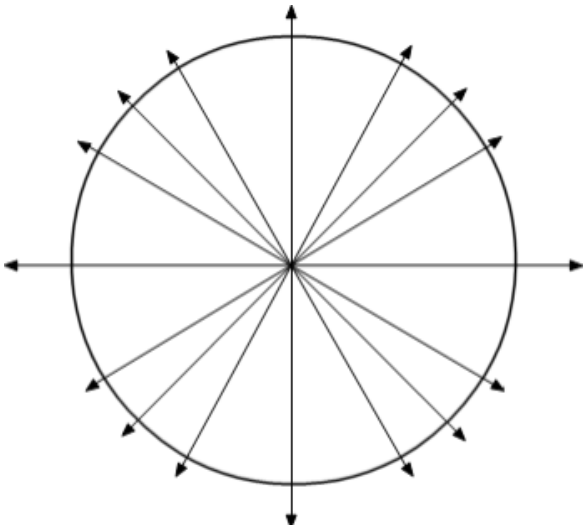
① $\left(\frac{4}{5}, \frac{-3}{5}\right)$ Is it on the ⊙?

$$\left(\frac{4}{5}\right)^2 + \left(\frac{-3}{5}\right)^2 \stackrel{?}{=} 1$$

$$\frac{16}{25} + \frac{9}{25} \stackrel{?}{=} 1$$

$$\frac{25}{25} = 1 \checkmark$$



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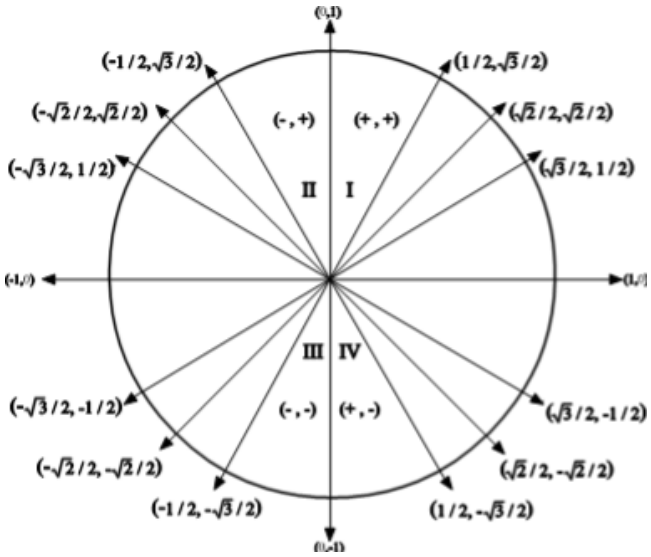
(0,1)
(-1/2,√3/2)
(1/2,√3/2)
(-√2/2,√2/2)
(√2/2,√2/2)
(-√3/2,1/2)
(√3/2,1/2)
(-,+)
(+,+)
II
I
(-1,0)
(1,0)
III
IV
(-,-)
(+,-)
(-√3/2,-1/2)
(√3/2,-1/2)
(-√2/2,-√2/2)
(√2/2,-√2/2)
(-1/2,-√3/2)
(1/2,-√3/2)
(0,-1)

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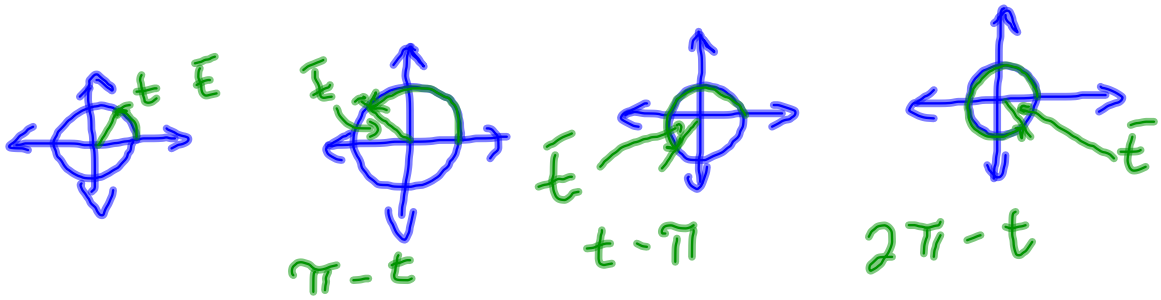
Reference Number - Let t be a real number. The *reference number* associated with t is the shortest distance along the unit circle between the terminal point determined by t and x-axis.

$\bar{t}$ location on the ⊙



Using reference numbers to find terminal points → ordered pair

1. **Find the reference number**
2. **Find the terminal point (a, b) determined by the reference number**
3. **The terminal point is $(\pm a, \pm b)$ where the signs are chosen according to the quadrant in which the terminal point lies**

Find the terminal point by each real number t.

a) $\frac{5\pi}{6}$ Reference # $\pi - \frac{5\pi}{6} = \frac{\pi}{6}$ $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$

$\rightarrow \left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$

b) $\frac{7\pi}{4}$ reference #

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

$\rightarrow \left(\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$