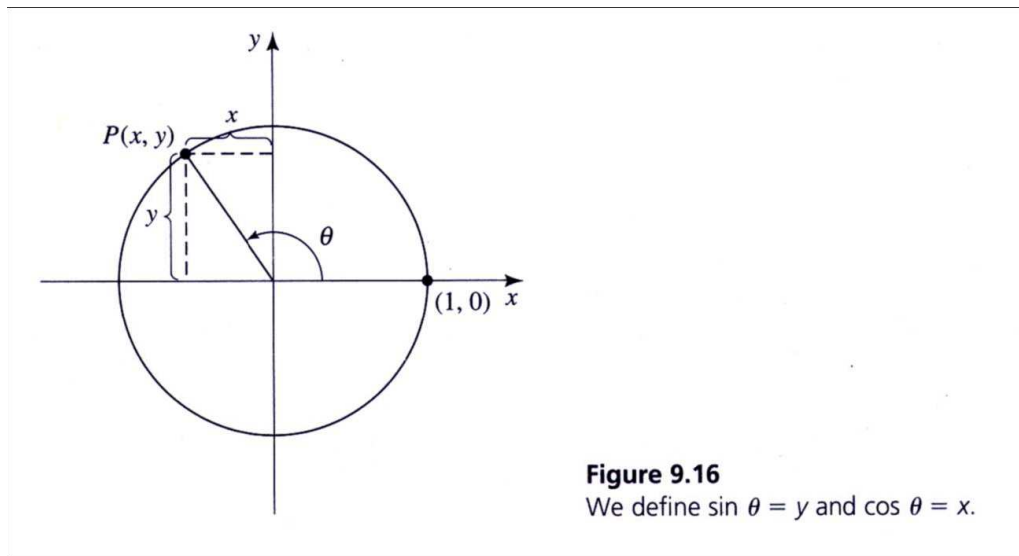


Section 9.2

We need to define three new functions, sine, cosine, and tangent



$$\text{and } \tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{y}{x}$$

For sine and cosine, this defines the functions for all real numbers. That is, the domain of each function is all real numbers. The range (y values) is -1 to +1, inclusive

Pythagorean Identity

Unit circle has equation $x^2 + y^2 = 1$

$$(\cos \theta)^2 + (\sin \theta)^2 = 1$$

$$\cos^2 \theta + \sin^2 \theta = 1$$

Trig values of different angles

	0	$\pi/2$	π	$3\pi/2$	2π
$\sin \theta$	0	1	0	-1	0
$\cos \theta$	1	0	-1	0	1

θ	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$
$\sin \theta$	$\frac{\sqrt{0}}{2} = 0$	$\frac{\sqrt{1}}{2} = \frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{4}}{2} = 1$
$\cos \theta$	$\frac{\sqrt{4}}{2} = 1$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{1}}{2} = \frac{1}{2}$	$\frac{\sqrt{0}}{2} = 0$

Signs of sine and cosine of angles t whose terminal side is in various quadrants

Quadrant II	Quadrant I
$\sin t > 0$	All > 0
$\tan t > 0$	$\cos t > 0$

Quadrant III

Quadrant IV

To find the value of a trig function (sine and cosine) whose terminal side is in a quadrant other than the first:

First draw the angle

Next find the reference angle, which is the smallest positive angle between the x-axis and the terminal side of the angle.

The angle of interest has sine and cosine of the same magnitude as the reference angle.

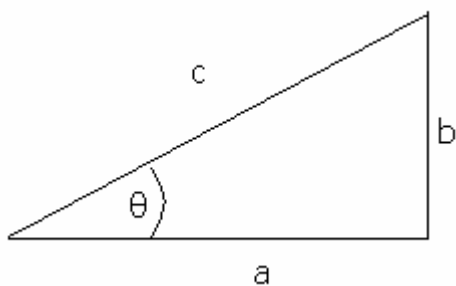
Example:

$$t = 4\pi/3,$$

reference angle is $\pi/3$

$$\sin 4\pi/3 = -\sin \pi/3 = -1/2$$

Right triangle definitions:



$$\sin \theta = \frac{\text{opp}}{\text{hyp}} = \frac{b}{c}$$

$$\cos \theta = \frac{\text{adj}}{\text{hyp}} = \frac{a}{c}$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{\text{opp}}{\text{adj}} = \frac{b}{a}$$