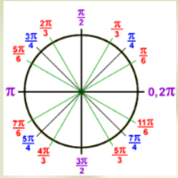
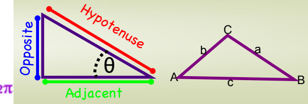
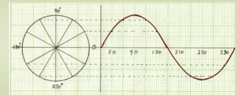






Math 1060 ~ Trigonometry

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

$\sin 2u = 2\sin u \cos u$

$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

$c^2 = a^2 + b^2 - 2ab\cos C$

6 Beyond The Unit Circle

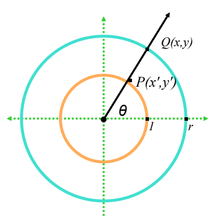
Learning Objectives

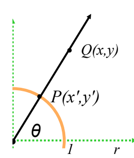
In this section you will:

- **Determine the values of the six trigonometric functions from the coordinates of a point on a circle, centered at the origin, with any radius *r*.**
- **Solve related application problems.**

<u>Determining Sine and Cosine</u>

Consider the acute angle θ drawn in standard position.





$Q(x,y)$ is a point on the terminal side of θ which lies on the circle $x^2 + y^2 = r^2$.

$P(x',y')$ is a point on the terminal side of θ which lies on the Unit Circle.

Theorem: If $Q(x,y)$ is a point on the terminal side of an angle θ, plotted in standard position, which lies on the circle $x^2 + y^2 = r^2$, then $x = r\cos\theta$ and $y = r\sin\theta$.

$$\cos\theta = \frac{x}{r} = \frac{x}{\sqrt{x^2+y^2}}$$

$$\sin\theta = \frac{y}{r} = \frac{y}{\sqrt{x^2+y^2}}$$

From these it is possible to determine all of the other four functions.

Ex 1: Determine the sine, secant and tangent of an angle which contains the point $Q(3, -2)$ when plotted in standard position.

Ex 2: If the terminal side of θ lies on the line $3x - 4y = 0$ in the third quadrant, find the values of the six trigonometric functions of θ by finding a point on the line.

Ex 3: Determine the radius of the circle of revolution for Salt Lake City, which is located at a latitude of 40.76º N. Assume the radius at the equator to be 3960 miles.

$\theta = 40.76°$