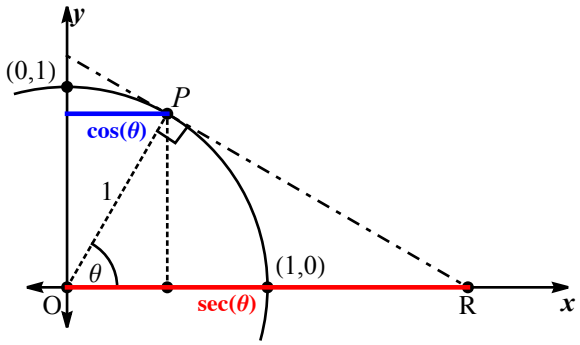
Trigonometry 32: Reciprocal Identities: Secant

Sine, cosine and tangent are three of six primary trigonometric functions. The **secant** function, $y = \sec(\theta)$ is the length OR (highlighted in red) in the unit circle diagram below.



From our previous work we know that PR = tan(θ) = sin(θ)/cos(θ) and OP = 1. OPR is a right triangle so the Pythagorean Theorem gives us:

$$OR^2 = OP^2 + PR^2$$

$$OR^2 = 1^2 + \frac{\sin^2\theta}{\cos^2\theta}$$

$$OR^2 = \frac{\cos^2\theta}{\cos^2\theta} + \frac{\sin^2\theta}{\cos^2\theta}$$

$$OR^2 = \frac{\cos^2\theta + \sin^2\theta}{\cos^2\theta}$$

$$OR^2 = \frac{1}{\cos^2\theta}$$

$$OR = \sec\theta = \frac{1}{\cos\theta}$$

This relationship is known as a **reciprocal identity** because the secant function is the reciprocal of the cosine function.

The graph of the secant function: