Domain and Range of Sine & Cosine

Domain: $(-\infty, \infty)$ ← sine and cosine

Range: $[-1, 1]$ ← sine and cosine

In both graphs the shape of the graph begins repeating after 2π.

$\sin(\theta + 2\pi) = \sin(\theta)$ and $\cos(\theta + 2\pi) = \cos(\theta)$

Negative Angle Identities

Sine is an odd function, symmetric about the origin, so $\sin(-\theta) = -\sin(\theta)$

Cosine is an even function, symmetric about the y-axis so $\cos(-\theta) = \cos(\theta)$

Example 1

$$\frac{\sin(-\theta)}{\tan\theta} \rightarrow \frac{-\sin\theta}{\tan\theta} \qquad \frac{-\sin\theta}{1} \cdot \frac{\cos\theta}{\sin\theta} = -\cos\theta$$

Example 2 A circle with radius 3 feet is mounted with its center 4 feet off the ground. The point closest to the ground is labeled P. Sketch a graph of the height above ground of the point P as the circle is rotated, then find a function that gives height in terms of the angle of rotation

$y = 3\sin\theta + 4$