Section 7.7

Graphs of Tangent, Cotangent, Cosecant, and Secant Functions

GRAPHS OF TANGENT

Recall that the period of tangent is π. The graph of $y = \tan x$ has vertical asymptotes at

$$x = \pm\frac{\pi}{2}, \pm\frac{3\pi}{2}, \pm\frac{5\pi}{2}, \dots .$$

The period of $y = \tan \omega x$ is $\frac{\pi}{\omega}$.

PROPERTIES OF THE TANGENT FUNCTION

1. The domain is the set of all real numbers, except odd multiples of $\frac{\pi}{2}$.
2. The range consists of all real numbers.
3. The tangent function is an odd function, as the symmetry of the graph with respect to the origin indicates.
4. The tangent function is periodic, with period π.
5. The x-intercepts are $\dots, -2\pi, -\pi, 0, \pi, 2\pi, \dots$; the y-intercept is 0.
6. Vertical asymptotes occurs at $x = \dots, -\frac{3\pi}{2}, -\frac{\pi}{2}, \frac{\pi}{2}, \frac{3\pi}{2}, \dots .$

GRAPHS OF COTANGENT

Recall that the period of cotangent is π. The graph of $y = \cot x$ has vertical asymptotes at

$$x = 0, \pm\pi, \pm 2\pi, \pm 3\pi, \dots .$$

The period of $y = \cot \omega x$ is $\frac{\pi}{\omega}$.

PROPERTIES OF THE COTANGENT FUNCTION

1. The domain is the set of all real numbers, except multiples of π.
2. The range consists of all real numbers.
3. The cotangent function is an odd function, as the symmetry of the graph with respect to the origin indicates.
4. The cotangent function is periodic, with period π.
5. The x-intercepts are $\dots, -\frac{3\pi}{2}, -\frac{\pi}{2}, \frac{\pi}{2}, \frac{3\pi}{2}, \dots$; there is no y-intercept.
6. Vertical asymptotes occurs at $x = \dots, -2\pi, -\pi, 0, \pi, 2\pi, \dots .$

GRAPHS OF SECANT

Recall that the period of secant is 2π. The graph of $y = \sec x$ has vertical asymptotes at

$$x = \pm\frac{\pi}{2}, \pm\frac{3\pi}{2}, \pm\frac{5\pi}{2}, \dots .$$

The period of $y = \sec \omega x$ is $\frac{2\pi}{\omega}$.

PROPERTIES OF THE SECANT FUNCTION

1. The domain is the set of all real numbers, except odd multiples of $\frac{\pi}{2}$.
2. The range is $(-\infty, -1] \cup [1, \infty)$.
3. The secant function is an even function, as the symmetry of the graph with respect to the y-axis indicates.
4. The secant function is periodic, with period 2π.
5. The are no x-intercepts; the y-intercept is 1.
6. Vertical asymptotes occurs at $x = \cdots, -\frac{3\pi}{2}, -\frac{\pi}{2}, \frac{\pi}{2}, \frac{3\pi}{2}, \ldots$.

GRAPHS OF COSECANT

Recall that the period of cosecant is 2π. The graph of $y = \csc x$ has vertical asymptotes at

$$x = 0, \pm\pi, \pm 2\pi, \pm 3\pi, \ldots.$$

The period of $y = \csc \omega x$ is $\frac{2\pi}{\omega}$.

PROPERTIES OF THE COSECANT FUNCTION

1. The domain is the set of all real numbers, except multiples of π.
2. The range is $(-\infty, -1] \cup [1, \infty)$.
3. The cosecant function is an odd function, as the symmetry of the graph with respect to the origin indicates.
4. The cosecant function is periodic, with period 2π.
5. There are no x-intercepts; there is no y-intercept.
6. Vertical asymptotes occurs at $x = \ldots, -2\pi, -\pi, 0, \pi, 2\pi, \ldots$.