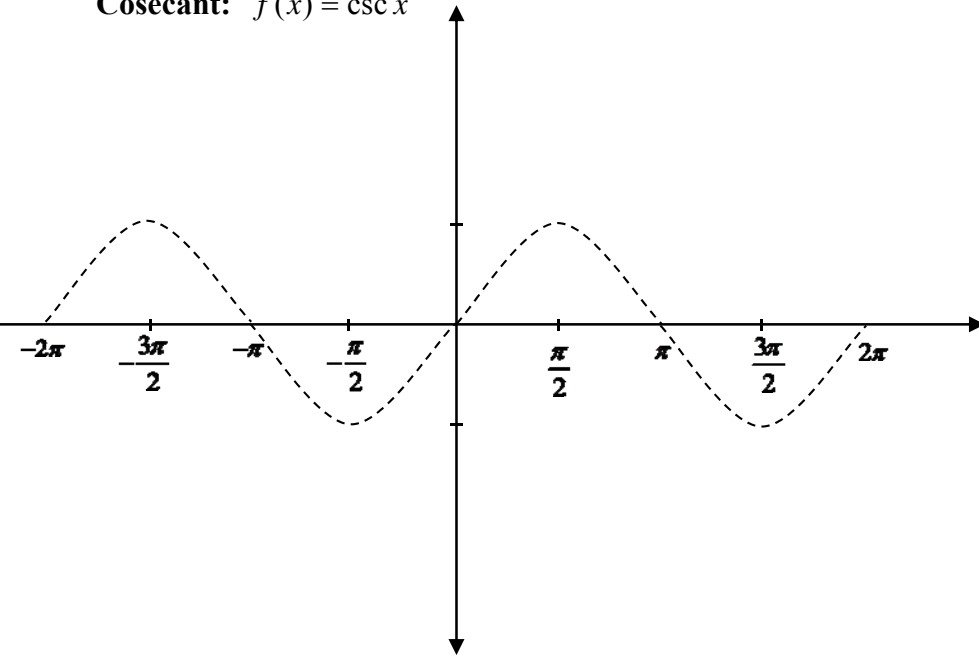


**Section 5.3a**  
**Graphs of the Cosecant and Secant Functions**

RECALL:  $\csc x = \frac{1}{\sin x}$  so where  $\sin x = 0$ ,  $\csc x$  has an asymptote

**Cosecant:**  $f(x) = \csc x$

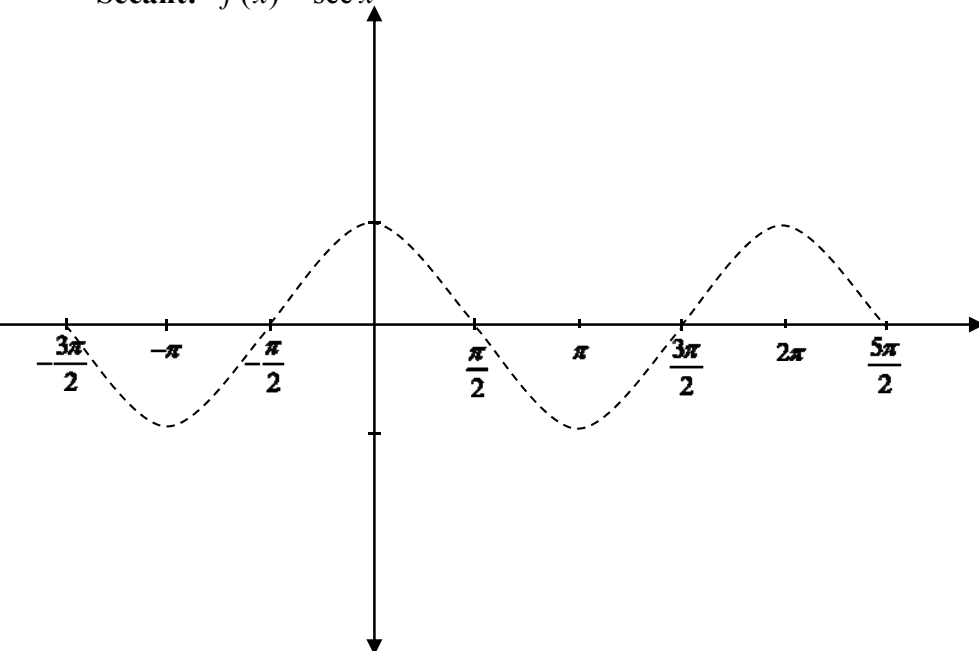


Period:  $2\pi$   
 Vertical Asymptote:  $x = k\pi$ ,  $k$  is an integer.  
 x-intercepts: None  
 y-intercept: None  
 Domain:  $x \neq k\pi$ ,  $k$  is an integer.  
 Range:  $(-\infty, -1] \cup [1, \infty)$

To graph  $y = A \csc(Bx - C)$ , first graph, **THE HELPER GRAPH**,  $y = A \sin(Bx - C)$ .

RECALL:  $\sec x = \frac{1}{\cos x}$  so where  $\cos x = 0$ ,  $\sec x$  has an asymptote.

**Secant:**  $f(x) = \sec x$



Period:  $2\pi$   
 Vertical Asymptote:  $x = \frac{k\pi}{2}$ ,  $k$  is an odd integer.  
 x-intercepts: None  
 y-intercept:  $(0, 1)$   
 Domain:  $x \neq \frac{k\pi}{2}$ ,  $k$  is an odd integer.  
 Range:  $(-\infty, -1] \cup [1, \infty)$

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To graph  $y = A \sec(Bx - C)$ , first graph, **THE HELPER GRAPH**,  $y = A \cos(Bx - C)$ .

**Example 1:** Graph  $f(x) = -\sec\left(\frac{\pi x}{2}\right)$ , but first describe the transformations.

**Example 2:** Graph  $f(x) = 2 \csc\left(2x - \frac{\pi}{2}\right)$ , but first describe the translations.

**Example 3:** Find the asymptotes for the following functions:

a.  $f(x) = 2 \csc(4x) - 3$

b.  $f(x) = -3\sec\left(\frac{\pi}{2}x\right)$