## TOPIC: GRAPHS OF OTHER TRIGONOMETRIC FUNCTIONS

### Graphing the Secant & Cosecant Functions

**Recall** **Reciprocal Identities**

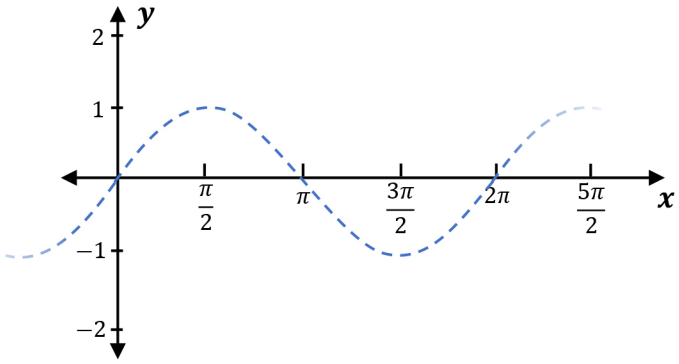
$$\csc x = \frac{1}{\sin x} \qquad \sec x = \frac{1}{\cos x}$$

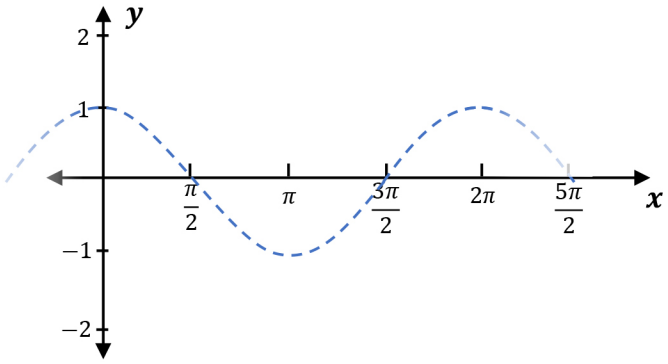
◆ Because they are reciprocals, we can use $\sin$ & $\cos$ to graph $\csc$ & $\sec$.

- When $\sin$ & $\cos = 0$, $\csc$ & $\sec$ are undefined, so they have _____ and approach $\infty$.

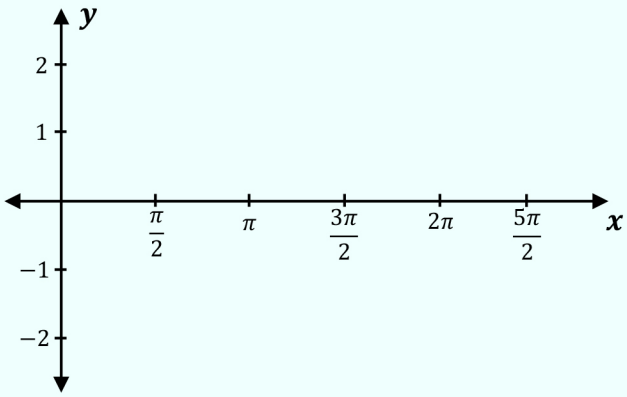
| $x$ | $0$ | $\frac{\pi}{2}$ | $\pi$ | $\frac{3\pi}{2}$ | $2\pi$ | $\frac{5\pi}{2}$ |
|---|---|---|---|---|---|---|
| $\sin x$ | $0$ | $1$ | $0$ | $-1$ | $0$ | $1$ |
| $\csc x$ | | | | | | |

| $x$ | $0$ | $\frac{\pi}{2}$ | $\pi$ | $\frac{3\pi}{2}$ | $2\pi$ | $\frac{5\pi}{2}$ |
|---|---|---|---|---|---|---|
| $\cos x$ | $1$ | $0$ | $-1$ | $0$ | $1$ | $0$ |
| $\sec x$ | | | | | | |



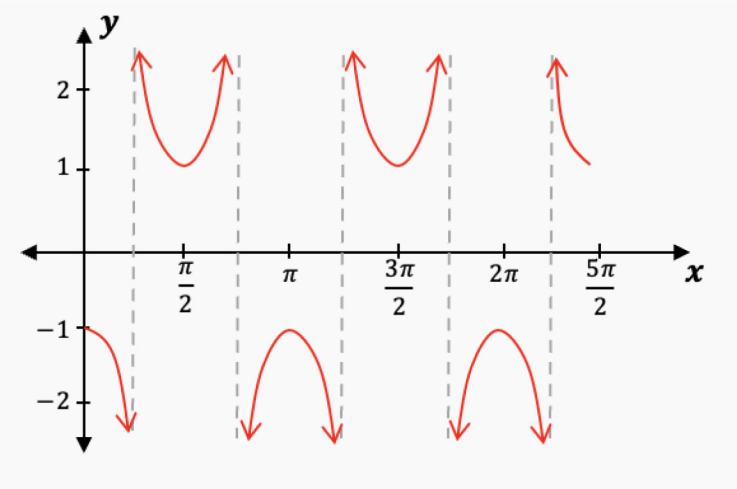




**EXAMPLE** Graph the function $y = \csc(2x)$.

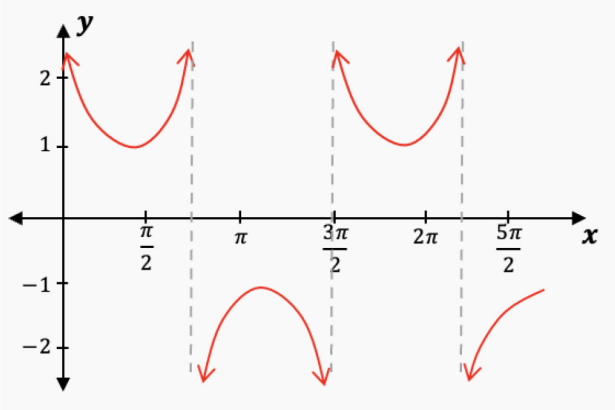


## TOPIC: GRAPHS OF OTHER TRIGONOMETRIC FUNCTIONS

**PRACTICE** Below is a graph of the function $y = \sec(bx - \pi)$. Determine the value of $b$.



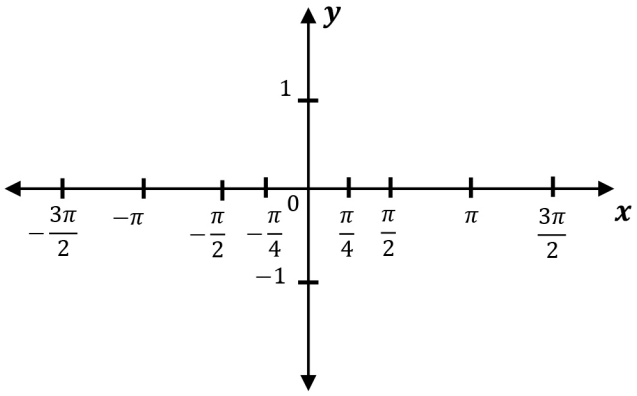

**PRACTICE** Below is a graph of the function $y = \csc(bx)$. Determine the value of $b$.



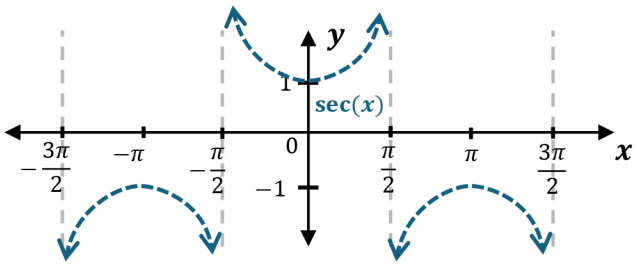
## TOPIC: GRAPHS OF OTHER TRIGONOMETRIC FUNCTIONS

### Graphing the Tangent Function

◆ Recall: $\tan(x) = \frac{\sin(x)}{\cos(x)}$, so we can use the values of $\sin$ & $\cos$ to graph $\tan$.



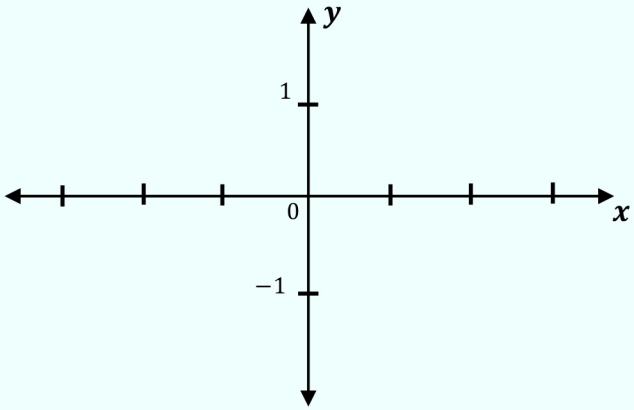

| $x$ | $-\frac{\pi}{2}$ | $-\frac{\pi}{4}$ | $0$ | $\frac{\pi}{4}$ | $\frac{\pi}{2}$ |
|---|---|---|---|---|---|
| $\sin x$ | $-1$ | $-\frac{\sqrt{2}}{2}$ | $0$ | $\frac{\sqrt{2}}{2}$ | $1$ |
| $\cos x$ | $0$ | $\frac{\sqrt{2}}{2}$ | $1$ | $\frac{\sqrt{2}}{2}$ | $0$ |
| $\tan x$ | | | | | |




- ***Like*** $\sec(x)$, $\tan(x)$ *repeats* and has *asymptotes* where $\cos(x) = 0$, at _____ multiples of ____.
- ***Unlike*** *other* trig functions, $\tan(x)$ has a period of ____. In general, New $y = \tan(bx) \rightarrow \text{Period } (T) =$ ——— *(Period of Tangent)*

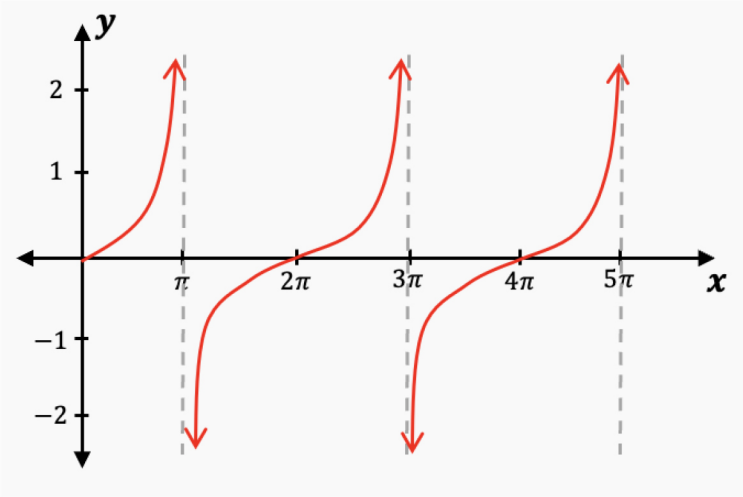
◆ You can use all of the same transformation rules you used for $\sin$ & $\cos$ to stretch and shift graphs of $\tan$!

**EXAMPLE** Graph the function $y = \tan\left(\frac{\pi}{2}x\right)$.



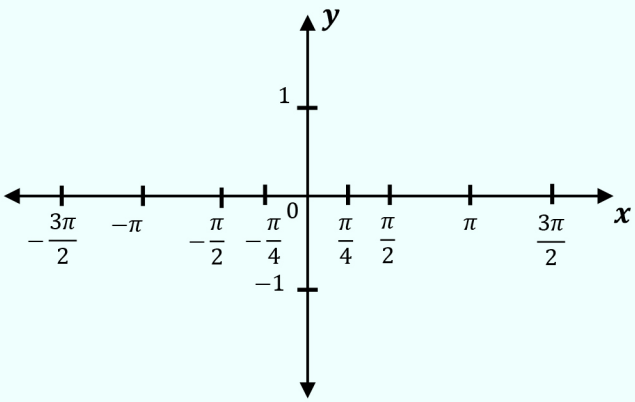
## TOPIC: GRAPHS OF OTHER TRIGONOMETRIC FUNCTIONS

**PRACTICE** Below is a graph of the function $y = \tan(bx)$. Determine the value of $b$.



## TOPIC: GRAPHS OF OTHER TRIGONOMETRIC FUNCTIONS

**EXAMPLE** Graph the function $y = \frac{1}{2} \cdot \tan\left(x - \frac{\pi}{2}\right)$.



## TOPIC: GRAPHS OF OTHER TRIGONOMETRIC FUNCTIONS

### Graphing the Cotangent Function

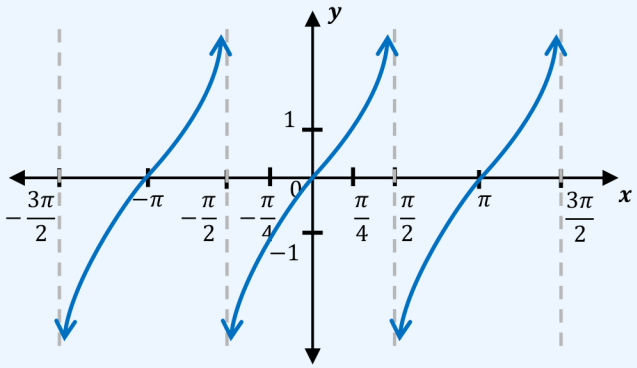
**Recall** **Reciprocal Identities**

$$\cot(x) = \frac{\cos(x)}{\sin(x)} = \frac{1}{\tan(x)}$$

◆ We can use the graph of tan to graph cot.

- $\cot(x)$ is similar to $\tan(x)$ but _____ upside-down, and has asymptotes at different values.

**Recall** **Tangent**

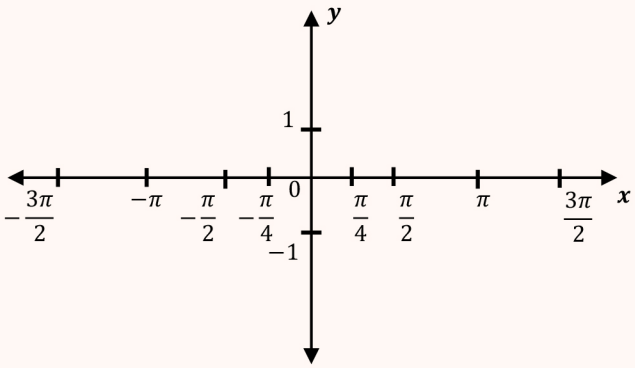



- Repeats every $[\pi \mid 2\pi]$

$$y = \tan(bx) \rightarrow \text{Period } (T) = \frac{\pi}{b}$$

- Asymptotes: **[odd | integer]** multiple of $\left[\frac{\pi}{2} \mid \pi\right]$

**New** **Cotangent**

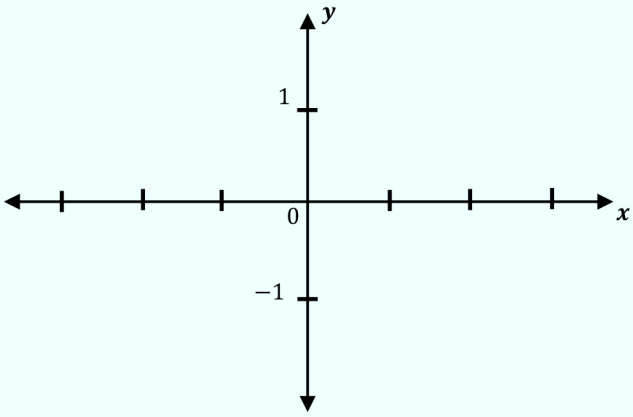



- Repeats every $[\pi \mid 2\pi]$

$$y = \cot(bx) \rightarrow \text{Period } (T) =$$

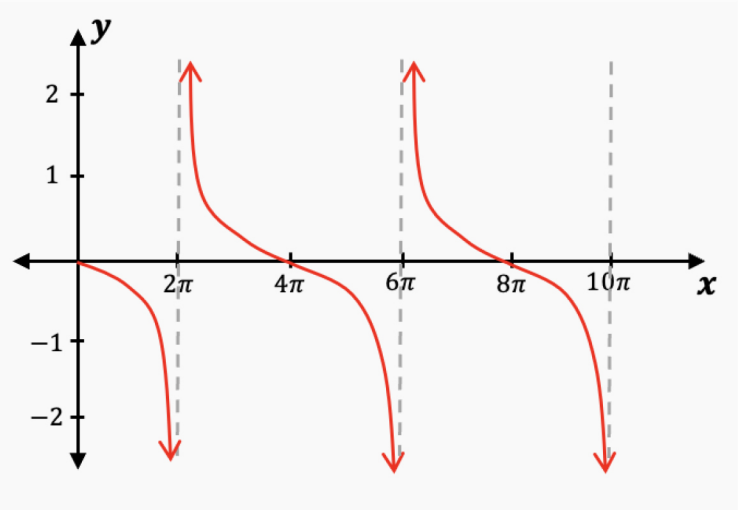
- Asymptotes: **[odd | integer]** multiple of $\left[\frac{\pi}{2} \mid \pi\right]$

**EXAMPLE** Graph the function $y = \cot(\pi x)$.



## TOPIC: GRAPHS OF OTHER TRIGONOMETRIC FUNCTIONS

**PRACTICE** Below is a graph of the function $y = \cot\left(bx + \frac{\pi}{2}\right)$. Determine the value of $b$.



## TOPIC: GRAPHS OF OTHER TRIGONOMETRIC FUNCTIONS

**EXAMPLE** Graph the function $y = -2 \cdot \cot\left(\frac{1}{4}x\right)$.