

4 Sections

Tan Pattern

Start at (0,0)

1 Step Forward, up 1

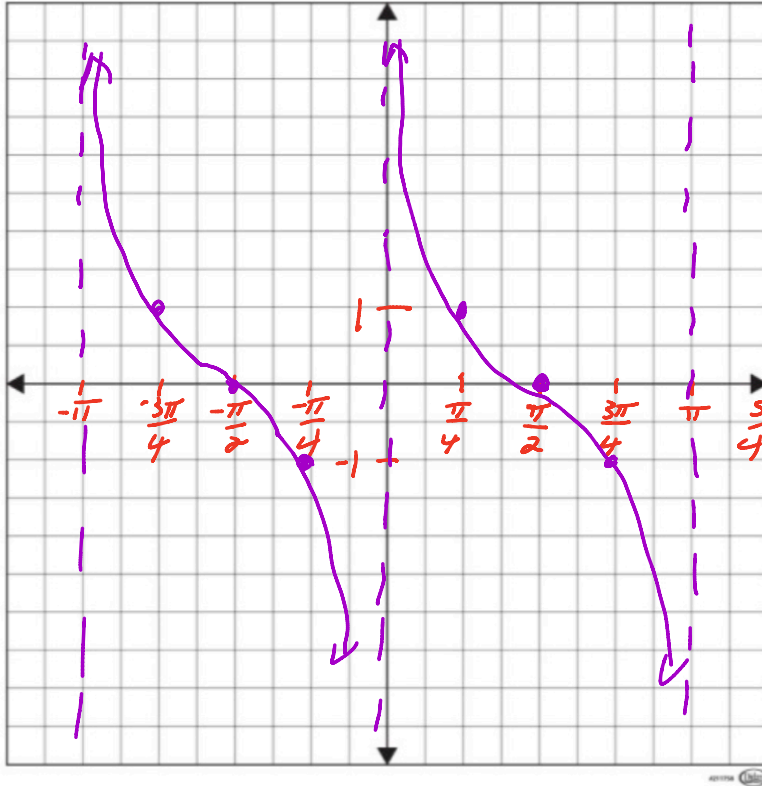
2 Steps Forward, as y

1 Step Back, Down 1

2 Steps Back as y

Tan x period = π

Section $\frac{\pi}{4}$



$$\cot x = y$$

PATtern

Start $x=0$, asy

1 Step Forward, up 1

2 Steps Forward, Even $y=0$

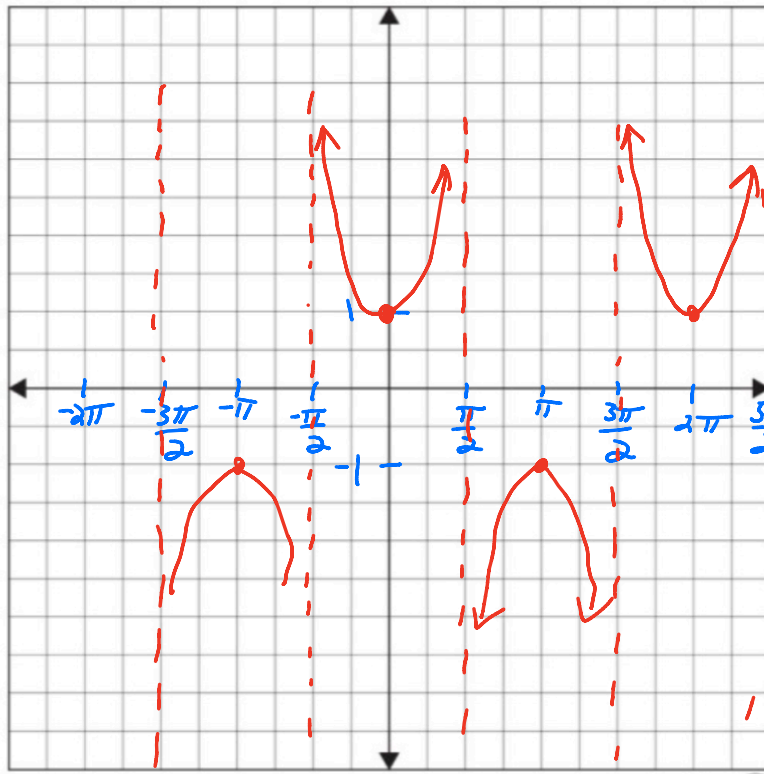
3 Steps Forward, Down 1

4 Steps Forward, asy

Period for \cot is π

Section $\frac{\pi}{4}$

$$\cot \frac{\pi}{4} = \frac{\sin \frac{\pi}{4}}{\cos \frac{\pi}{4}} = \frac{\frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}} = 1$$



Reciprocal $\frac{1}{x}$

$$\sec x = \frac{1}{\cos x}$$

PATTERN

START AT $x=0$, UP!

Forward one step, up!

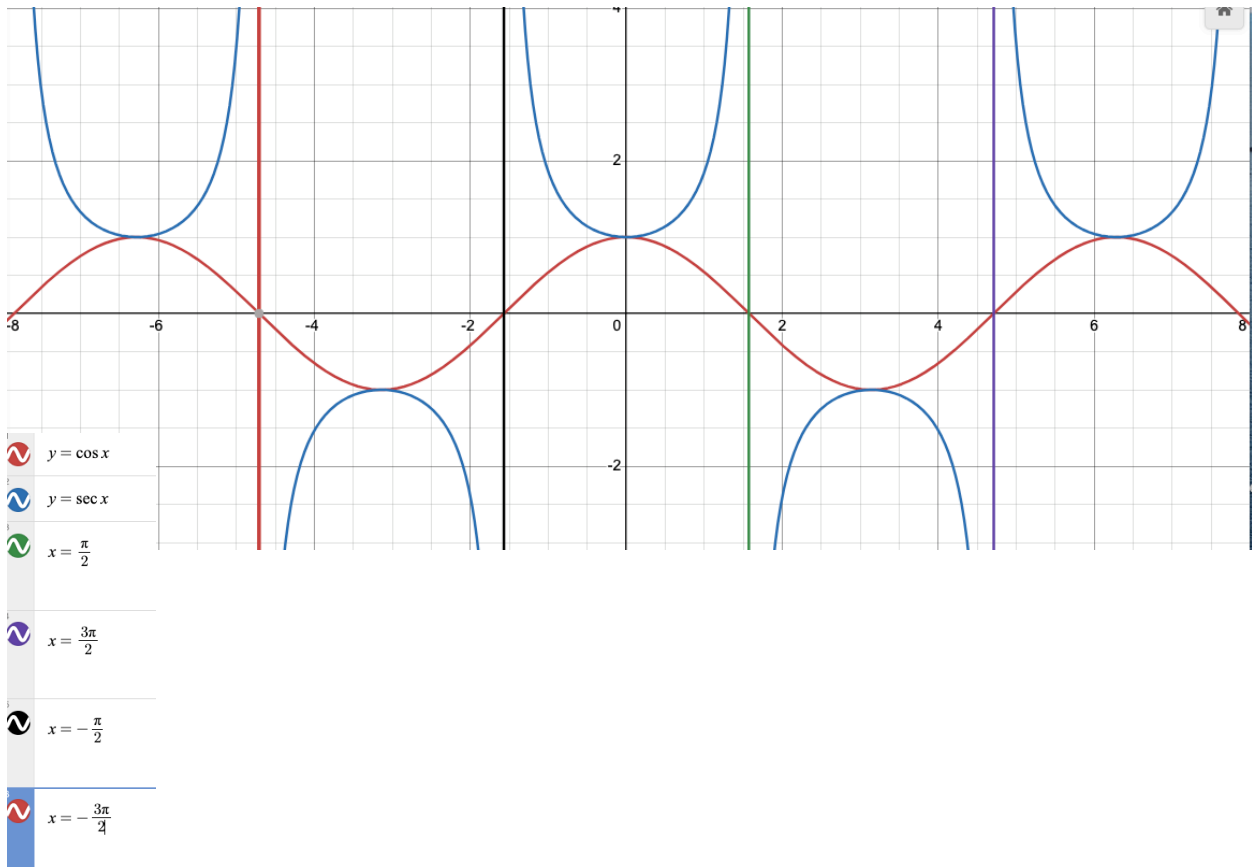
Forward 2 steps, down!

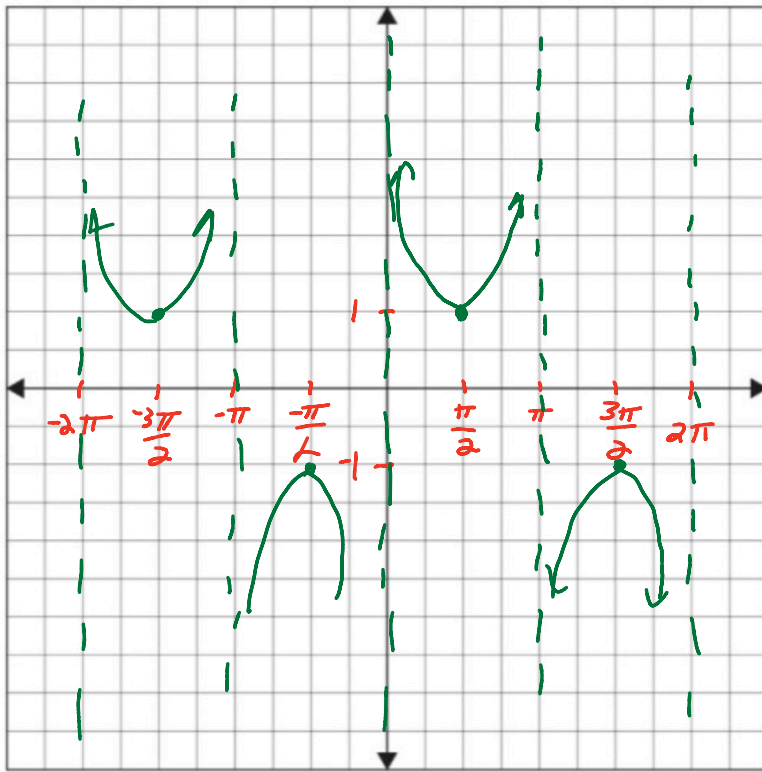
Forward 3 steps, up!

Forward 4 steps, up!

Sec x PERIOD IS 2π

$$\text{SECTION } \frac{2\pi}{4} = \frac{\pi}{2}$$





$$\frac{1}{\sin x} = \csc x$$

PATTERN $\csc x$

1. START AT $x=0$, ASY

1 STEP FORWARD, UP 1

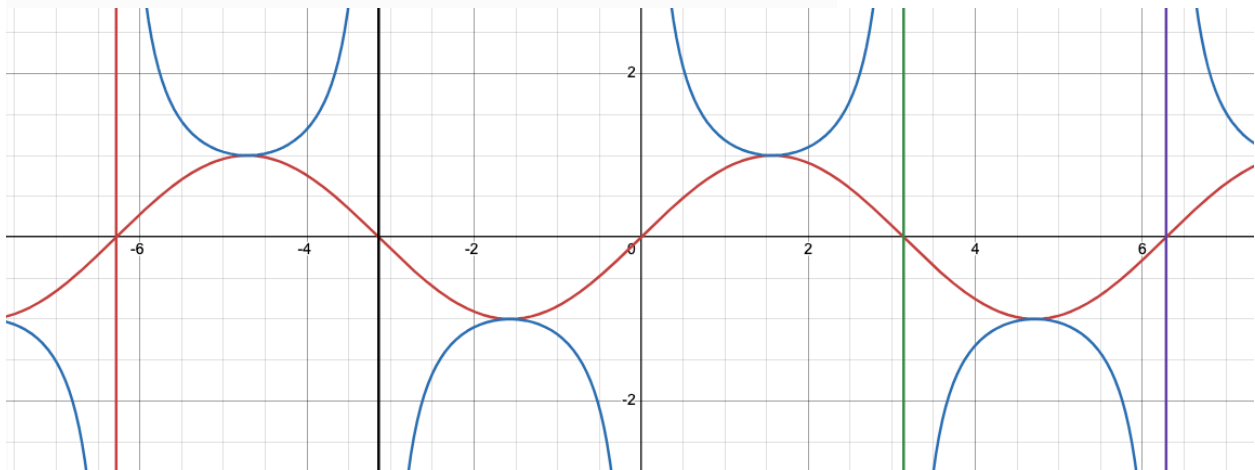
2 STEPS FORWARD, ASY

3 STEPS FORWARD, DOWN 1

4 STEPS FORWARD, ASY

Period of $\csc = 2\pi$

SECTION = $\frac{2\pi}{4} = \frac{\pi}{2}$



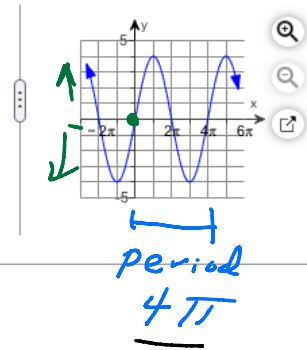
- 1 $y = \sin x$
- 2 $y = \csc x$
- 3 $x = \pi$
- 4 $x = 2\pi$
- 5 $x = -\pi$
- 6 $x = -2\pi$

Find an equation for the graph.

$$A \sin Bx = 4 \sin Bx = 4 \sin \frac{1}{2}x$$

↑
Amp

$$Bx = 2\pi$$
$$B = \frac{4\pi}{4\pi} = \frac{2\pi}{4\pi} \Rightarrow B = \frac{1}{2}$$



Type the equation of the given graph in the form $y = A \sin Bx$ or $y = A \cos Bx$.

Section = π

$\sin 3x$ Find period

Normal period = 2π

$$\frac{3x}{3} = \frac{2\pi}{3}$$

New period $\frac{2\pi}{3} = x$

Determine the range of each of the following functions. Then give a viewing rectangle, or window, that shows two periods of the function's graph.

a. $f(x) = 2 \sin \left(x + \frac{\pi}{6} \right) - 1$ \leftarrow Down 1

b. $f(x) = \sin 2 \left(x + \frac{\pi}{6} \right) - 1$

$F(x) = 2 \sin x$



$F(x) = 2 \sin x - 1$



Periods of 2π

$\sin x$

$\cos x$

$\sec x$

$\csc x$

Periods π

$\tan x$

$\cot x$

Find sections, divide period by 4

Follow Pattern

$y = a \sec(Bx + C) + d$

\uparrow
Amp
How
Far
UP/down

\uparrow
Shifts
Graph
UP/down

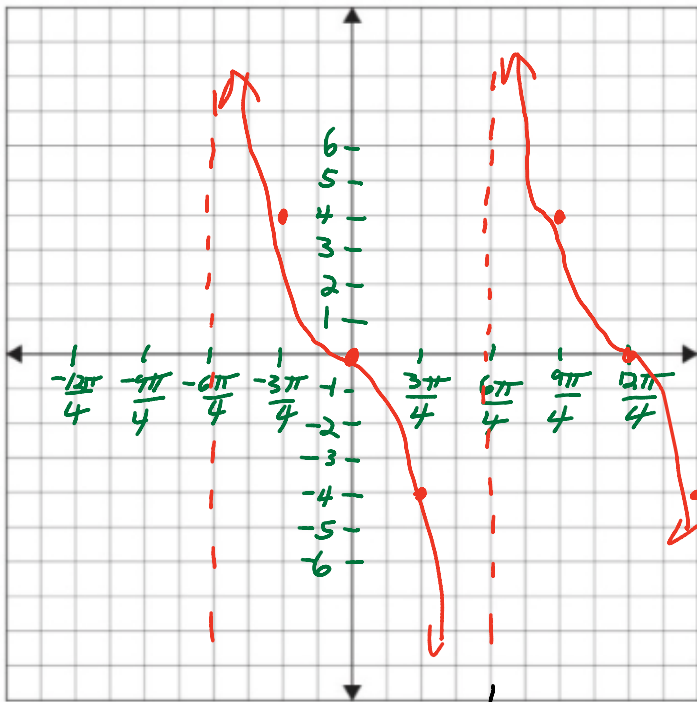
1. To Find Start Set $Bx + C = 0$
Solve For x

2. To Find New Period Set $Bx = 2\pi$
Solve For x

3. sections divide New Period by 4

Graph two periods of the given tangent function.

$$y = -4 \tan\left(\frac{1}{3}x\right)$$



$$\frac{6\pi}{4} = \frac{3\pi}{2}$$

Flip
 $y = -4 \tan \frac{1}{3}x$

↑

Amp

New Period

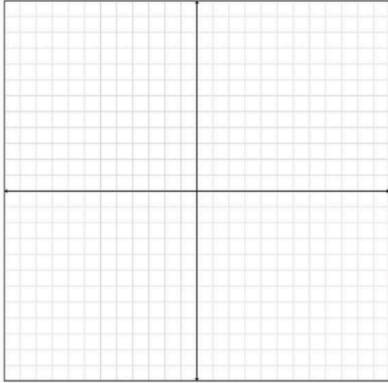
$$\frac{1}{3}x = \pi \cdot 3$$

$$x = 3\pi \text{ (New Period)}$$

Section

$$\frac{3\pi}{4}$$

$$\frac{-12\pi}{4} = -3\pi$$



new
period

$$\cancel{4} \cdot \frac{x}{\cancel{4}} = 2\pi \cdot 4$$

$$x = 8\pi \text{ new period}$$

Graph two periods of the given tangent function.

$$y = 3 \tan \left(x + \frac{\pi}{3} \right) - 1$$

How Far
up/Down

whole graph down 1

To Find New Start

$$x + \frac{\pi}{3} = 0$$

Solve For X

$$x = -\frac{\pi \cdot 4}{3 \cdot 4} = -\frac{4\pi}{12}$$

$$\text{period} = \pi$$

$$\text{Sections} = \frac{\pi \cdot 3}{4 \cdot 3} \frac{3\pi}{12}$$

