$$y = A \sin B(x - c) + D$$

$Amp = A = \dfrac{Max - Min}{2}$

$Vertical = (C) = \dfrac{Max + Min}{2}$

$period = p$

Horizontal Stretch/Shrink

$B = \dfrac{2\pi}{p}$

How to choose an appropriate model based on the behavior at some given time, T.

$y = A \cos B(t - T) + C$
if at time T the function attains a maximum value

$y = -A \cos B(t - T) + C$
if at time T the function attains a minimum value

$y = A \sin B(t - T) + C$
if at time T the function halfway between a minimum and a maximum value

$y = -A \sin B(t - T) + C$
if at time T the function halfway between a maximum and a minimum value

Construct a sinusoid with the given amplitude and period that goes through the given point.

$\frac{2\pi}{B} = P$

$\frac{2\pi}{P} = B$

A) Amp: 4, period 4π, point (0, 0)

$A = 4$ $\quad Per = 4\pi$

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

$\frac{1}{2} = B$

$y = 4 \sin \frac{1}{2} x$

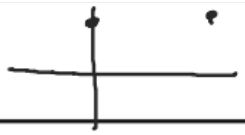
B) Amp: 2.5, period $\frac{\pi}{5}$, point (2, 0)

$A = 2.5$

$B = \frac{2\pi}{P} = \frac{2\pi}{\frac{\pi}{5}} = 10$

Right 2

$y = 2.5 \sin 10(x - 2)$



9.6

$Amp = A = \frac{Max - Min}{2}$

$Vertical = (C) = \frac{Max + Min}{2}$

$period = p$

Horizontal Stretch/Shrink

$B = \frac{2\pi}{p}$

How to choose an appropriate model based on the behavior at some given time, T.

$y = A \cos B(t - T) + C$ if at time T the function attains a maximum value

$y = -A \cos B(t - T) + C$ if at time T the function attains a minimum value

$y = A \sin B(t - T) + C$ if at time T the function halfway between a minimum and a maximum value

$y = -A \sin B(t - T) + C$ if at time T the function halfway between a maximum and a minimum value

Example 7: Calculating the Ebb and Flow of Tides

One particular July 4th in Galveston, TX, high tide occurred at 9:36 am. At that time the water at the end of the 61st Street Pier was 2.7 meters deep. Low tide occurred at 3:48 p.m, at which time the water was only 2.1 meters deep. Assume that the depth of the water is a sinusoidal function of time with a period of half a lunar day (about 12 hrs 24 min)

a) Model the depth, D, as a sinusoidal function of time, t, algebraically then graph the function.

$y = A \cos B(x - c) + D$

$\frac{24}{60} = .4$

$A = \frac{max - min}{2}$

$\frac{2.7 - 2.1}{2}$

$A = .3$

$B = \frac{2\pi}{12.4} = \frac{\pi}{6.2}$

$Per = 12.4$

$C = 9.6$

$D = \frac{max + min}{2}$

$\frac{2.7 + 2.1}{2}$

$D = 2.4$

$y = .3 \cos \frac{\pi}{6.2}(x - 9.6) + 2.4$

b) At what time on the 4th of July did the first low tide occur.

3.40

3:24 am

c) What was the approximate depth of the water at 6:00 am and at 3:00 pm?

d) What was the first time on July 4th when the water was 2.4 meters deep?

80) Temperature Data: The normal monthly Fahrenheit temperatures in Helena, MT, are shown in the table below (month 1 = January)

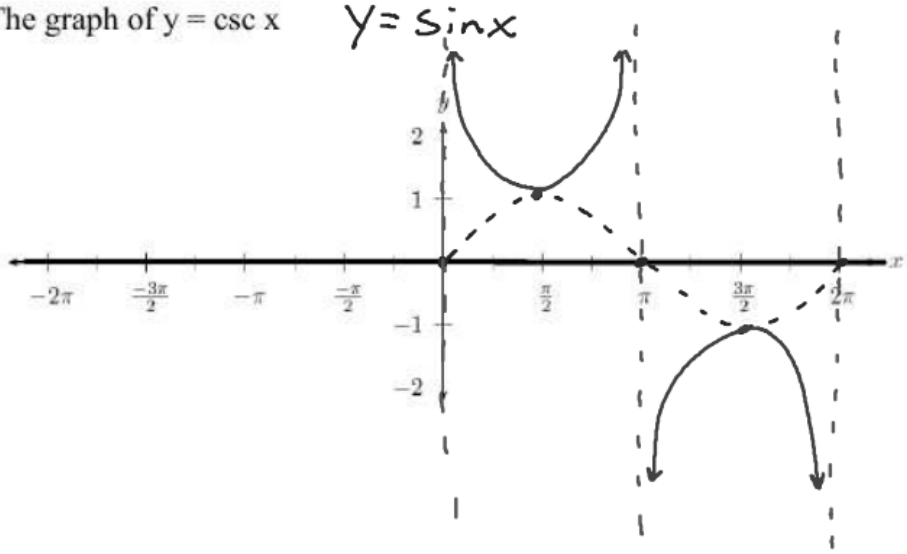
Model the temperature T as a sinusoidal function of time using 20 as the minimum value and 68 as the maximum value. Support your answer graphically by graphing your function with a scatter plot.

M	1	2	3	4	5	6	7	8	9	10	11	12
T	20	26	35	44	53	61	68	67	56	45	31	21

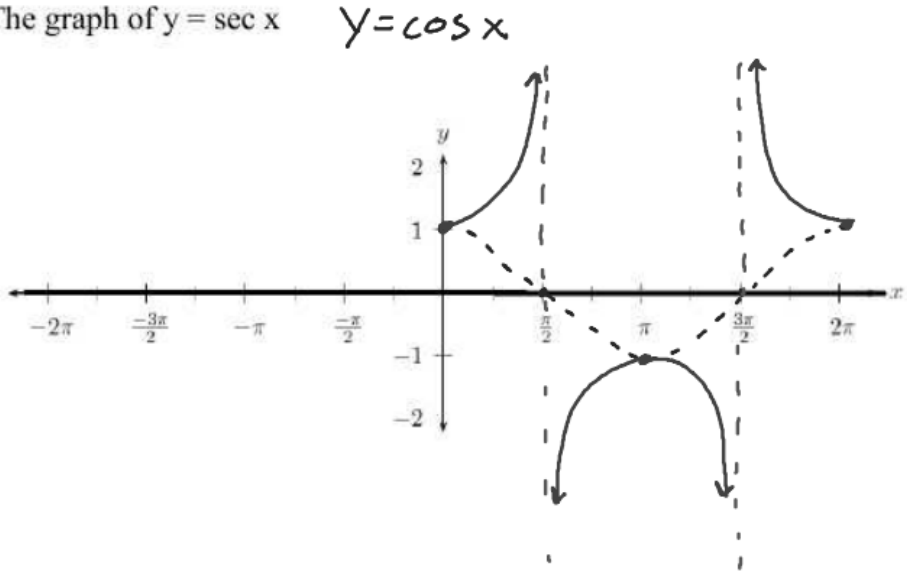
What you'll Learn About

- The graphs of the other 4 trig functions

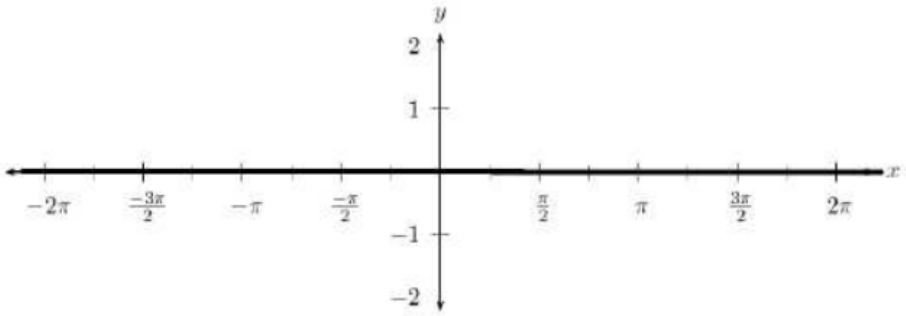
The graph of y = csc x



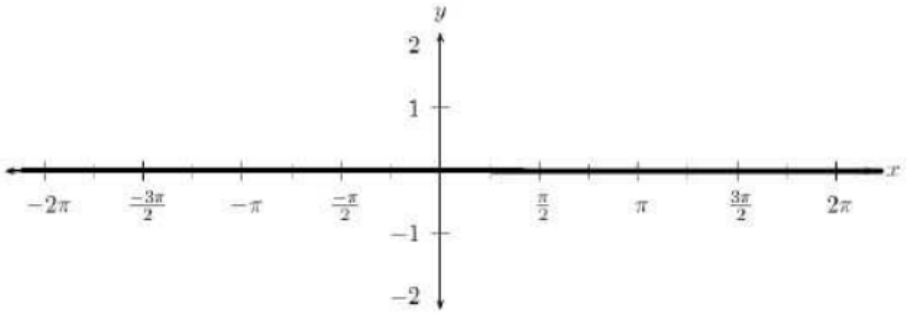
The graph of y = sec x



The graph of y = tan x



The graph of y = cot x



	Describe the graph of the function in terms of a basic trigonometric function. Locate the vertical asymptotes and graph 2 periods of the function. A) $y = 2\tan(3x)$ B) $y = -\cot(2x)$ C) $y = \sec(4x)$ D) $y = -\csc\left(\frac{x}{3}\right)$

Describe the transformations required to obtain the graph of the given function form a basic trigonometric graph.

A) $y = 5\tan x$

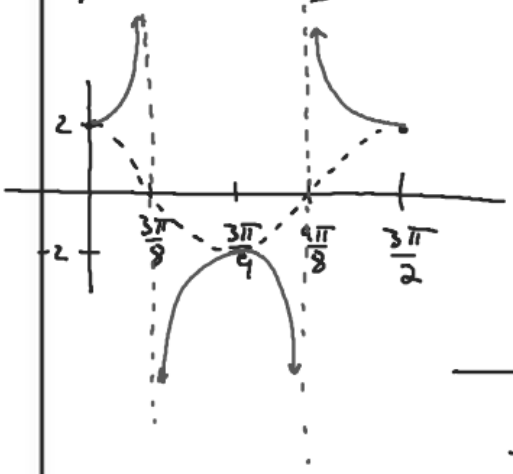
B) $y = -3\cot\left(\frac{x}{2}\right)$

C) $y = 2\sec\frac{4x}{3}$

Amp = 2

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

$y = 2\cos\frac{4x}{3}$



D) $y = -4\csc 2\pi x - 3$

Amp = 4

Reflect over x

Per = 1

Down 3