

To find the equation given a graph you are going backwards from graphing.
You need to be able to find a, b, c, and d for the standard form:

$$f(x) = a \sin b(x-c) + d \text{ or } f(x) = a \cos b(x-c) + d$$

To write the equation, you need to do the following:

1. Find the middle of the graph (sinusoidal axis)
2. Determine if you are looking for a sine curve or a cosine curve
3. Locate your starting point and ending point
4. Then, find each of the following:

a = _____ (need to know amplitude) -

b = _____ (need to know period) -

c = _____ (need to know starting point for x) -

d = _____ (need to know how the graph shifted from sinusoidal to x-axis)

a.) Find a sin(x) function:

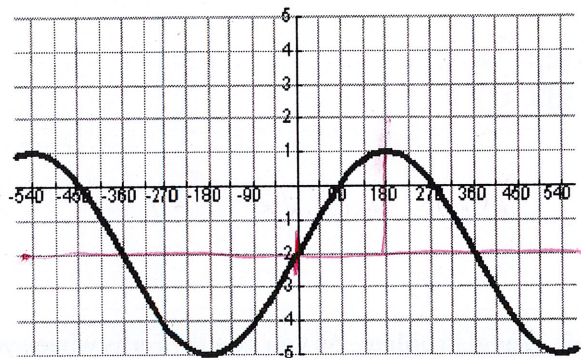
a - Amplitude: 3

b - Period (end-start): 720

c - HS (start): 0

d - VS from x-axis: -2

$$f(x) = 3 \sin \frac{1}{2}(x) - 2$$



b.) Find a +cos(x) function:

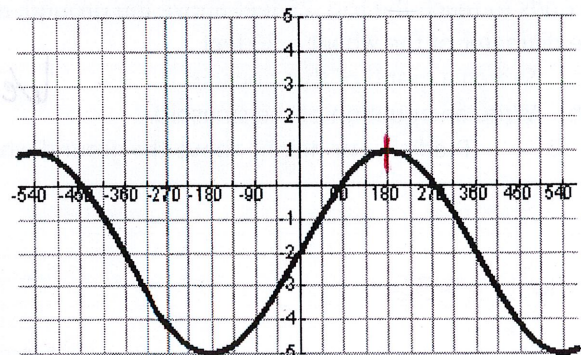
a - Amplitude: 3

b - Period (end-start): 720

c - HS (start): 180

d - VS from x-axis: -2

$$f(x) = 3 \cos \frac{1}{2}(x - 180) - 2$$



c.) Find a -cos(x) function:

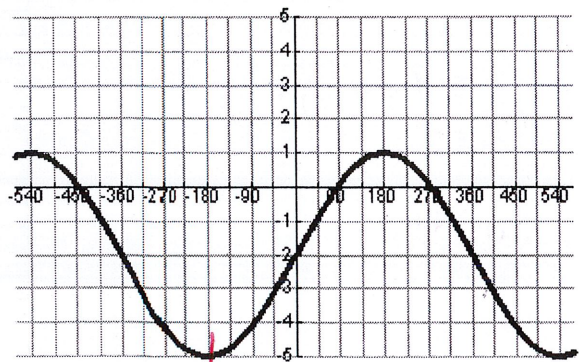
a - Amplitude: 3

b - Period (end-start): 720

c - HS (start): -180

d - VS from x-axis: -2

$$f(x) = -3 \cos \frac{1}{2}(x + 180) - 2$$



Example 2: Write the equation

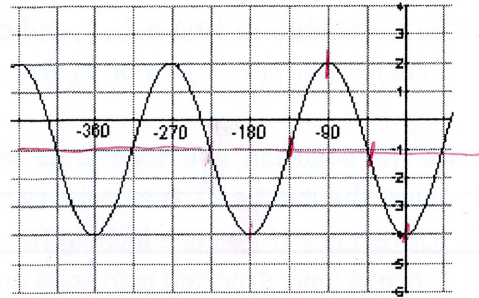
- a - Amplitude: 3
- b - Period (end-start): 180
- c - HS (start): varies
- d - VS from x-axis: -1

$$f(x) = 3 \sin 2(x+135) - 1 \quad (\text{or } x-45)$$

$$f(x) = -3 \sin 2(x+45) - 1 \quad (\text{or } x-05)$$

$$f(x) = 3 \cos 2(x+90) - 1$$

$$f(x) = -3 \cos 2x - 1$$

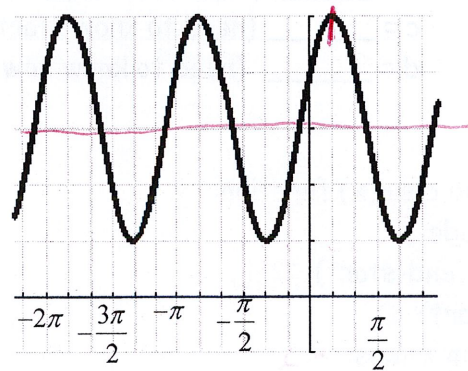


Example 2: Find a +cos(x) function (radians)

- Amplitude (a): 2
- Period (b): π

- HS (c): $\pi/6$
- VS (d): 3

$$f(x) = 2 \cos 2(x - \pi/6) + 3$$



Ferris Wheel Problem As you ride the Ferris wheel, your distance from the ground varies sinusoidally with time. Let t be the number of seconds that have elapsed since the Ferris wheel started. You find that it takes you 2 seconds to reach the top, 25 feet above the ground, and that the wheel makes a revolution once every 10 seconds. The diameter of the wheel is 20 feet.

- a. Sketch a graph of this sinusoid.
- b. Write an equation of the sinusoid.
 - i. Predict your height above the ground when: $t = 3, t = 6, t = 9$

We'll talk about this tomorrow

$$a = 10$$

$$b = \frac{360}{x} = 10 \quad x = 36$$

$$c = 2$$

$$d = 15$$

$$f(x) = 10 \cos 36(x-2) + 15$$

$$f(3) \approx 23.09 \text{ ft}$$

$$f(6) \approx 6.91 \text{ ft}$$

$$f(9) \approx 11.91 \text{ ft}$$

