

Evaluation of Sinusoidal Functions

Name: Kyle

For each of the following functions use algebraic methods to:

a.) Find $f(x)$ for the given value of x

b.) Find the general solutions and the first three positive values of x for the given value of $f(x)$

Round to three decimal places.

$$1. \quad f(x) = 2 + 5 \cos \frac{\pi}{10}(x-3) \quad a. \quad f(x) = 2 + 5 \cos \frac{\pi}{10}(8.3 - 3) = \boxed{1.529}$$

a.) Find $f(8.3)$

$$b. \quad 5 = 2 + 5 \cos \frac{\pi}{10}(x-3)$$

$$3 = 5 \cos \frac{\pi}{10}(x-3)$$

$$\frac{3}{5} = \cos \frac{\pi}{10}(x-3)$$

$$\frac{\pi}{10}(x-3) = \cos^{-1}\left(\frac{3}{5}\right)$$

QI QIV

$$\frac{\pi}{10}(x-3) = .927 + 2\pi h$$

$$x-3 = 2.951 + 20h$$

$$x = 5.951 + 20h$$

-ans or $2\pi - \text{ans}$
 $2\pi - .927$

~~+~~ -.927
or 5.356

$$\frac{\pi}{10}(x-3) = -.927 + 2\pi h$$

$$x-3 = -2.951 + 20h$$

$$x = .049 + 20h$$

$$2. \quad y = 4 + 3 \sin \frac{\pi}{6}(x-2)$$

a.) Find $f(12.7)$

$$a. \quad 4 + 3 \sin \frac{\pi}{6}(12.7 - 2) = 2.112$$

b.) $f(x) = 6$

$$b. \quad 6 = 4 + 3 \sin \frac{\pi}{6}(x-2)$$

$$2 = 3 \sin \frac{\pi}{6}(x-2)$$

$$\frac{2}{3} = \sin \frac{\pi}{6}(x-2)$$

$$\sin^{-1}\left(\frac{2}{3}\right) = \frac{\pi}{6}(x-2)$$

QI

QII

~~+~~ $\pi - \text{ans}$ $\pi - .730$

$$\sqrt{.730} = \frac{\pi}{6}(x-2)$$

+2πn

$$2.412 = \frac{\pi}{6}(x-2)$$

+2πn

1st 3 x values:

3.394

6.607

15.394

$$1.394 + 12n = x-2$$

$$3.394 + 12n = x$$

$$4.607 + 12n = x-2$$

$$6.607 + 12n = x$$

$$3. y = -2 + 4 \sin \frac{\pi}{2}(x - 0.3)$$

a.) Find $f(2.8)$

b.) $f(x) = 0$

$$a. -2 + 4 \sin \frac{\pi}{2}(2.8 - 3) = \boxed{-4.828}$$

$$b. 0 = -2 + 4 \sin \frac{\pi}{2}(x - 3)$$

$$2 = 4 \sin \frac{\pi}{2}(x - 3)$$

$$\frac{2}{4} = \sin \frac{\pi}{2}(x - 3)$$

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

$$\text{QI} \quad .524 + 2\pi n = \frac{\pi}{2}(x - 3)$$

$$.334 + 4n = x - 3$$

$$\boxed{.634 + 4n = x}$$

$$\text{QII} \quad 2.618 + 2\pi n = \frac{\pi}{2}(x - 3)$$

$$1.667 + 4n = x - 3$$

$$\boxed{1.967 + 4n = x}$$

~~π-ans~~

~~π-.524~~

2.618

1st 3 x-values

$$\boxed{.634, 1.967, 4.634}$$

$$4. y = -1 + 3 \cos \frac{\pi}{3}(x + 5.2)$$

a.) Find $f(5)$

b.) $f(x) = 1$

$$a. -1 + 3 \cos \frac{\pi}{3}(5 + 5.2) = \boxed{-1.927}$$

$$b. 1 = -1 + 3 \cos \frac{\pi}{3}(x + 5.2)$$

$$2 = 3 \cos \frac{\pi}{3}(x + 5.2)$$

$$\frac{2}{3} = \cos \frac{\pi}{3}(x + 5.2)$$

$$\cos^{-1}(\frac{2}{3}) = \frac{\pi}{3}(x + 5.2)$$

$$\text{QIV} \quad .841 + 2\pi n = \frac{\pi}{3}(x + 5.2)$$

$$.803 + 6n = x + 5.2$$

$$\boxed{-4.397 + 6n = x}$$

~~-ans~~
~~or~~
~~2π-ans~~

$$-.841 + 2\pi n = \frac{\pi}{3}(x + 5.2)$$

$$-.803 + 6n = x + 5.2$$

~~1B3~~

$$\boxed{-6.003 + 6n = x}$$

1st 3 x-values

$$\boxed{1.603, 5.997, 7.603}$$

For each of the following functions use your graphing calculator to:

c.) Find $f(x)$ for the given value of x

d.) Find the first three positive values of x for the given value of $f(x)$

Round to three decimal places.

$$5. \quad y = 3 + 5 \sin \frac{\pi}{9}(x - 11)$$

a.) Find $f(7)$

$$3 + 5 \sin \frac{\pi}{9}(7 - 11) = \boxed{-1.924}$$

b.) $f(x) = 2$

$$y_1 = 2$$

$$y_2 = 3 + 5 \sin \frac{\pi}{9}(x - 11)$$

$$\boxed{2.577, 10.423, 20.577}$$

$$7. \quad y = 5 + 4 \sin \frac{\pi}{12}(x + 10)$$

a.) Find $f(1)$

$$5 + 4 \sin \frac{\pi}{12}(1 + 10) = \boxed{6.035}$$

b.) $f(x) = 2.5$

$$y_1 = 2.5$$

$$y_2 = 5 + 4 \sin \frac{\pi}{12}(x + 10)$$

$$\boxed{4.579, 11.421, 28.579}$$

$$6. \quad y = 1 + 6 \cos \frac{\pi}{13}(x - 20)$$

a.) Find $f(4.3)$

$$1 + 6 \cos \frac{\pi}{13}(4.3 - 20) = \boxed{-3.767}$$

b.) $f(x) = -4.5$

$$y_1 = -4.5$$

$$y_2 = 1 + 6 \cos \frac{\pi}{13}(x - 20)$$

$$\boxed{5.299, 8.701, 31.299}$$

$$8. \quad y = 1 + 3 \cos \frac{\pi}{8}(x + 7)$$

a.) Find $f(13)$

$$1 + 3 \cos \frac{\pi}{8}(13 + 7) = \boxed{13}$$

b.) $f(x) = -1$

$$y_1 = -1$$

$$y_2 = 1 + 3 \cos \frac{\pi}{8}(x + 7)$$

$$\boxed{3.142, 14.858, 19.142}$$