4.1 Evaluating Sinusoidal Functions   Name:_____

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. $f(x) = 2 + 5\cos\dfrac{\pi}{10}(x-3)$

1st 3 positive:
0.049, 5.952, 20.049

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

  b.) $f(x) = 5$

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

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

① $.927 + 2\pi n = \frac{\pi}{10}(x-3)$
$\frac{10}{\pi}(.927 + 2\pi n) = \frac{10}{\pi}\cdot\frac{\pi}{10}(x-3)$
$2.952 + 20n = x - 3$
$+3 \qquad +3$
$\boxed{5.952 + 20n = x}$ ← general solution

② $\dfrac{S|A}{T|C}$ cosine positive in QI & QIV $\begin{smallmatrix}-\text{ans or}\\2\pi-\text{ans}\end{smallmatrix}$

$-.927 + 2\pi n = \frac{\pi}{10}(x-3)$
$\frac{10}{\pi}(-.927 + 2\pi n) = \frac{10}{\pi}\cdot\frac{\pi}{10}(x-3)$
$-2.951 + 20n = x - 3$
$+3 \qquad +3$
$\boxed{0.049 + 20n = x}$

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

  a.) Find $f(12.7) = 2.112$

  b.) $f(x) = 6$
$6 = 4 + 3\sin\frac{\pi}{6}(x-2)$
$\frac{2}{3} = \sin\frac{\pi}{6}(x-2)$
$\sin^{-1}(\frac{2}{3}) = \frac{\pi}{6}(x-2)$

① $.730 + 2\pi n = \frac{\pi}{6}(x-2)$
$1.394 + 12n = x - 2$
$\boxed{3.394 + 12n = x}$

② $\dfrac{S|A}{T|C}$ sine positive in QI & QII $\pi - \text{ans}$
$\pi - .730$
$2.412 + 2\pi n = \frac{\pi}{6}(x-2)$
$\boxed{6.607 + 12n = x}$

1st 3 pos:
3.394, 6.607, 15.394

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

  a.) Find $f(2.8) = -4.828$

  b.) $f(x) = 0$
$0 = -2 + 4\sin\frac{\pi}{2}(x-0.3)$
$\sin^{-1}(\frac{2}{4}) = \frac{\pi}{2}(x-0.3)$

QI
① $.524 + 2\pi n = \frac{\pi}{2}(x-0.3)$
$\boxed{.634 + 4n = x}$

② $\pi - \text{ans}$

QII
$2.618 + 2\pi n = \frac{\pi}{2}(x-.3)$
$\boxed{1.967 + 4n = x}$

1st 3 pos:
0.634, 1.967, 4.634

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

  a.) Find $f(5) = -1.927$

  b.) $f(x) = 1$

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

QI
$.841 + 2\pi n = \frac{\pi}{3}(x+5.2)$
$\boxed{-4.397 + 6n = x}$

QIV $-\text{ans or } 2\pi - \text{ans}$
$-.841 + 2\pi n = \frac{\pi}{3}(x+5.2)$
$\boxed{-6.003 + 6n = x}$

1st 3 pos
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. $y = 3 + 5\sin\frac{\pi}{9}(x-11)$

   a.) Find $f(7)$

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

   b.) $f(x) = 2$

   $Y_1 = 3 + 5\sin\frac{\pi}{9}(x-11)$
   $Y_2 = 2$

   $\boxed{2.577, 10.423, 20.577}$

   $\boxed{\text{WINDOW}}$ Xmin = 0
   Xmax = 27

   Ymin = -2
   Ymax = 8

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

   a.) Find $f(4.3) = -3.767$

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

   $Y_1 = 1 + 6\cos\frac{\pi}{13}(x-20)$
   $Y_2 = -4.5$

   $\boxed{5.299, 8.701, 31.299}$

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

   a.) Find $f(1) = 6.035$

   b.) $f(x) = 2.5$

   $\boxed{4.579, 11.421, 28.579}$

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

   a.) Find $f(13) = 1$

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

   $\boxed{3.142, 14.858, 19.142}$