Name:___________________________

SM3 7.1: Graphing Sine & Cosine

Vocabulary: amplitude, period, midline, general form, extended form, phase shift, vertical shift, frequency

Problems:

Identify the amplitude and period for each problem.

1) $f(x) = \sin(4x)$

amp: 1, per: $\frac{2\pi}{4} = \frac{\pi}{2}$

2) $y = 2\cos(x)$

amp: 2, per: 2π

3) $g(x) = 4\sin(3x)$

amp: 4, per: $\frac{2\pi}{3}$

4) $h(x) = \cos(.5x + 2)$

amp: 1, per: $\frac{2\pi}{.5} = 4\pi$

5) $y = 4 + \sin\left(\frac{3}{2}x\right)$

amp: 1, per: $\frac{2\pi}{3/2} = \frac{4\pi}{3}$

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

amp: 1, per: $\frac{2\pi}{2} = \pi$

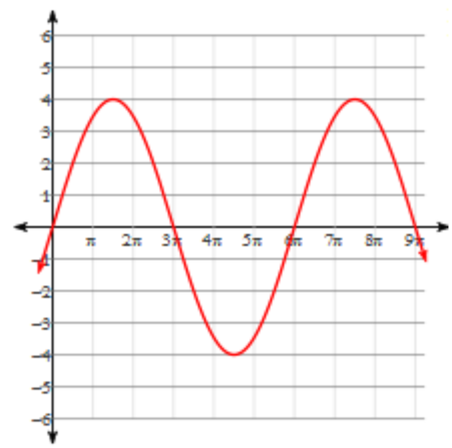
7) $f(x) = \frac{1}{2}\cos(x - 2) + 1$

amp: $\frac{1}{2}$, per: 2π

8) $g(x) = -3\sin(-x)$

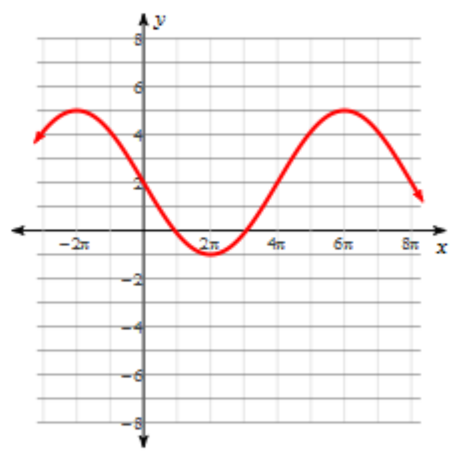
amp: 3, per: 2π

9)



amp: 4, per: 6π

10)



amp: 3, per: 8π

Describe how changes in the given variable change the shape of the curve of $y = \sin x$:

$$y = a\sin\big(b(x - h)\big) + k$$

11) $k = 2$

shift up 2

12) $k = \frac{1}{3}$

shift up $\frac{1}{3}$

13) $a = 2$

twice as tall

14) $a = \frac{1}{3}$

$\frac{1}{3}$ as tall

15) $b = 2$

2x as many waves

16) $b = \frac{1}{3}$

$\frac{1}{3}$ as many waves

17) $h = -\pi$

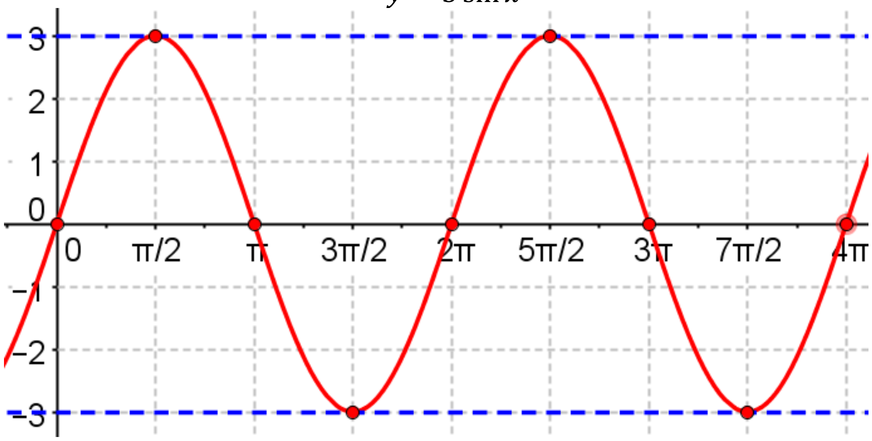
shifts left π

18) $h = \frac{\pi}{3}$

shifts right $\frac{\pi}{3}$

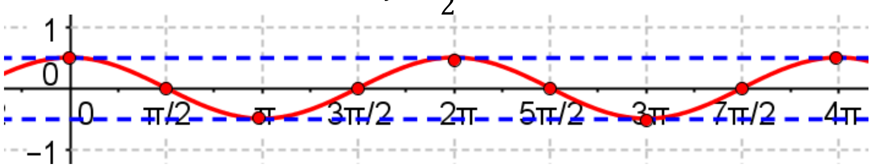
Sketch an appropriate coordinate axis and graph two periods of the function.

19) $y = 3\sin x$



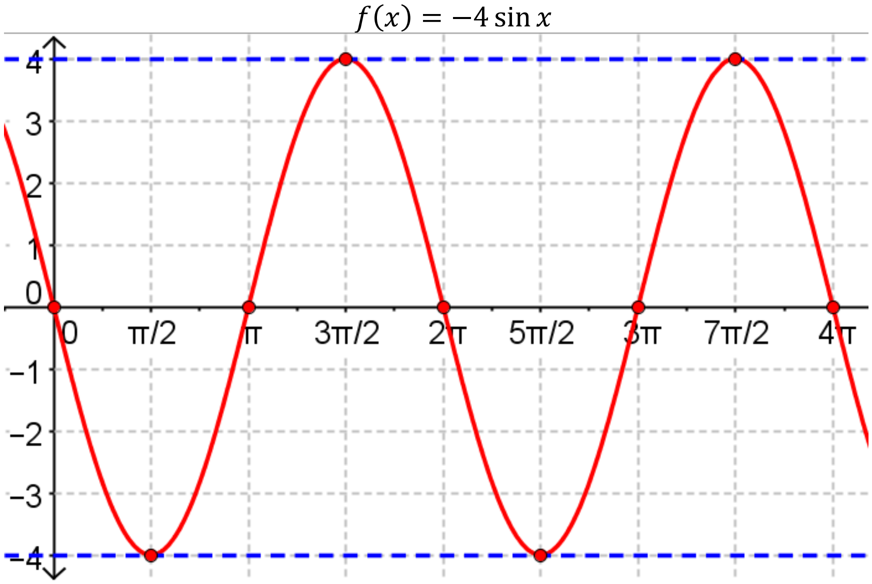
Amp:	3
Per:	2π
P.S.:	0
V.S.:	0
Scale:	$\frac{\pi}{2}$

20) $y = \frac{1}{2}\cos x$



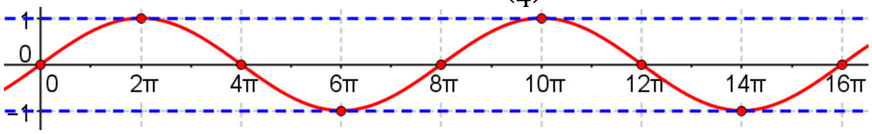
Amp:	$\frac{1}{2}$
Per:	2π
P.S.:	0
V.S.:	0
Scale:	$\frac{\pi}{2}$

21) $f(x) = -4\sin x$



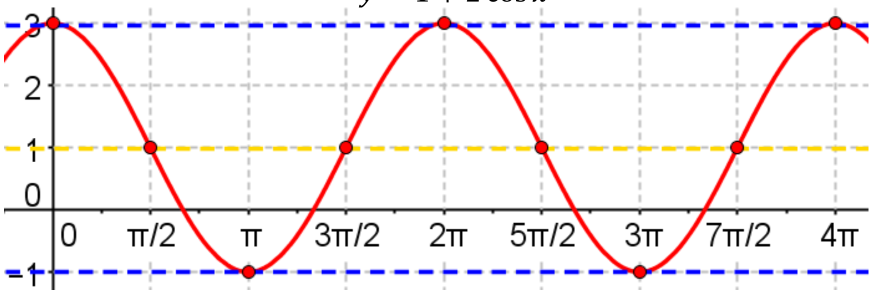
Amp:	4
Per:	2π
P.S.:	0
V.S.:	0
Scale:	$\frac{\pi}{2}$

22) $g(x) = \sin\left(\frac{x}{4}\right)$



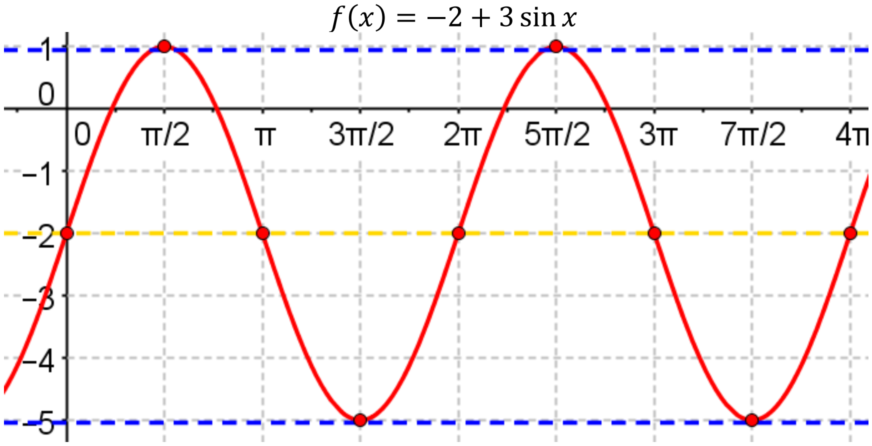
Amp:	1
Per:	8π
P.S.:	0
V.S.:	0
Scale:	2π

23) $y = 1 + 2\cos x$



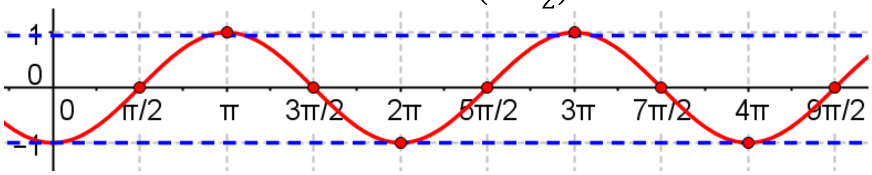
Amp:	2
Per:	2π
P.S.:	0
V.S.:	1
Scale:	$\frac{\pi}{2}$

24) $f(x) = -2 + 3\sin x$



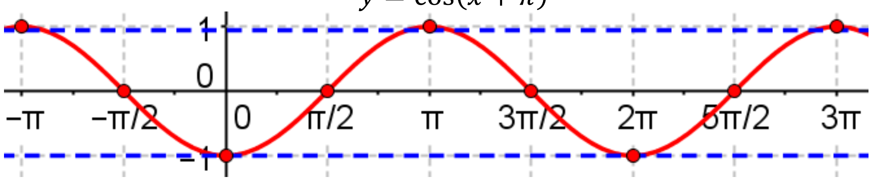
Amp:	3
Per:	2π
P.S.:	0
V.S.:	-2
Scale:	$\frac{\pi}{2}$

25) $h(x) = \sin\left(x - \frac{\pi}{2}\right)$



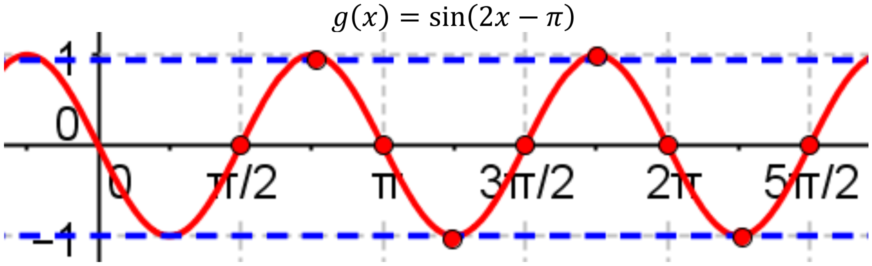
Amp:	1
Per:	2π
P.S.:	$\rightarrow \frac{\pi}{2}$
V.S.:	0
Scale:	$\frac{\pi}{2}$

26) $y = \cos(x + \pi)$



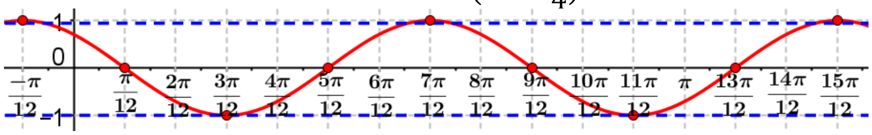
Amp:	1
Per:	2π
P.S.:	$\leftarrow \pi$
V.S.:	0
Scale:	$\frac{\pi}{2}$

27) $g(x) = \sin(2x - \pi)$



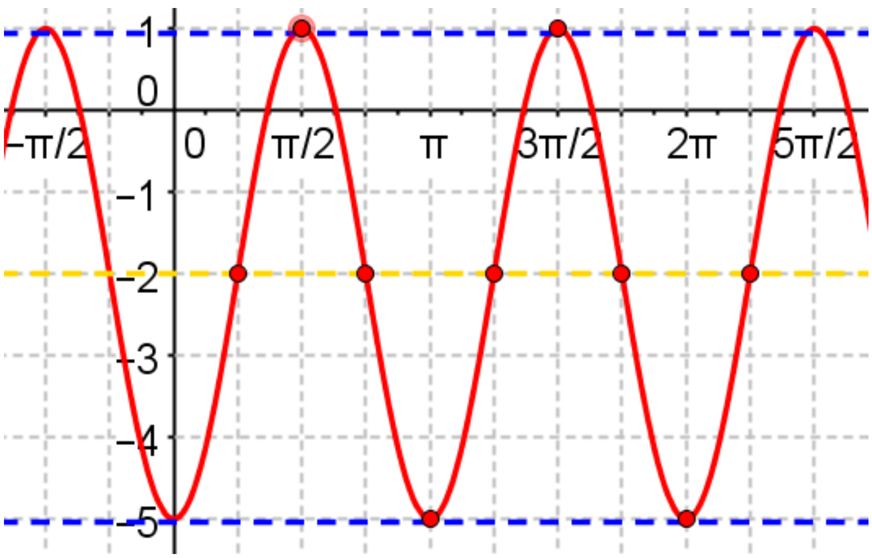
Amp:	1
Per:	π
P.S.:	$\rightarrow \frac{\pi}{2}$
V.S.:	0
Scale:	$\frac{\pi}{4}$

28) $f(x) = \cos\left(3x + \frac{\pi}{4}\right)$



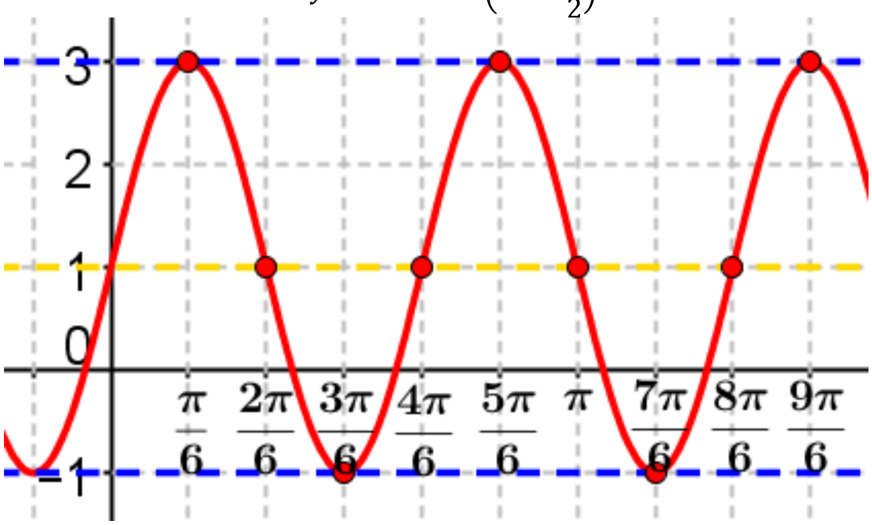
Amp:	1
Per:	$\frac{2\pi}{3}$
P.S.:	$\leftarrow \frac{\pi}{12}$
V.S.:	0
Scale:	$\frac{2\pi}{12}$

29) $f(x) = 3\sin\left(2x - \frac{\pi}{2}\right) - 2$



Amp:	3
Per:	π
P.S.:	$\rightarrow \frac{\pi}{4}$
V.S.:	-2
Scale:	$\frac{\pi}{4}$

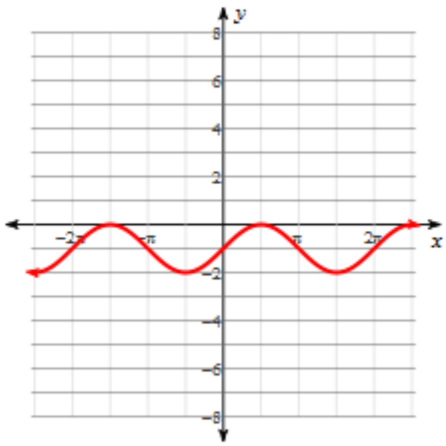
30) $y = 1 + 2\cos\left(3x - \frac{\pi}{2}\right)$



Amp:	2
Per:	$\frac{2\pi}{3}$
P.S.:	$\rightarrow \frac{\pi}{6}$
V.S.:	1
Scale:	$\frac{\pi}{6}$

For 31-32, write the simplest form of a) the sine function and b) the cosine function for the graphs shown below.

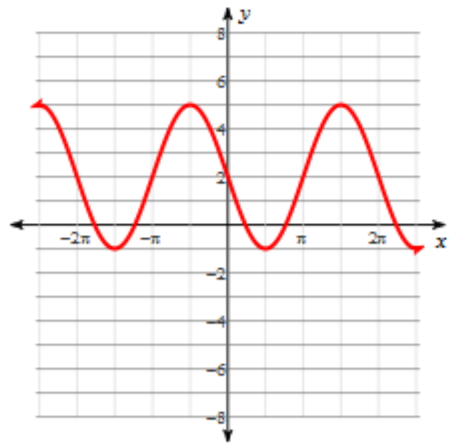
31)



a) $y = \sin(x) - 1$

b) $y = \cos\left(x - \frac{\pi}{2}\right) - 1$

32)



a) $y = 2 - 3\sin(x)$ or

$y = 3\sin(x + \pi) + 2$

b) $y = 3\cos\left(x + \frac{\pi}{2}\right) + 2$

33) The frequency of a sound wave is 750 cycles per second. If the sound intensity can be modeled by the sine function $S(t) = 0.05\sin(750t)$, what is the period of the sound wave?

$$per = \frac{2\pi}{750} = \frac{\pi}{375} \approx .00838$$

34) The voltage in an alternating current circuit can be modeled by the function $V(t) = 175\sin(110\pi t)$. How many times does the voltage reach a peak positive or negative value in 1 second?

$per = \frac{2\pi}{110\pi} = \frac{1}{55}$ so 55 cycles occur per second.

So that is 55 max values and 55 min values so 110 times in 1 second.

35) The alarm in a smoke detector produces a high-pitched sound when smoke is detected. The intensity of the sound can be modeled by the function $I(t) = \cos(3 \cdot 10^4 \cdot \pi \cdot t)$. What are the period and frequency of the sound intensity? The frequency is measured in cycles per second.

$$per = \frac{2\pi}{3 \cdot 10^4 \cdot \pi} = \frac{2}{3 \cdot 10^4} = \frac{2}{30000} = \frac{1}{15000}$$

frequency is 15000 cycles per second.