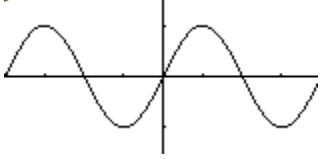


$$f(x) = \sin x$$

x	-2π	$-3\pi/2$	$-\pi$	$-\pi/2$	0	$\pi/2$	π	$3\pi/2$	2π
$\sin(x)$	0	1	0	-1	0	1	0	-1	0

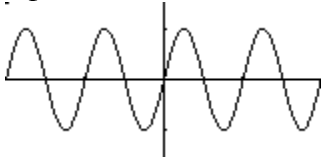
Amplitude = 1 and Period = 2π



$$f(x) = \sin 2x$$

x	$-\pi$	$-3\pi/4$	$-\pi/2$	$-\pi/4$	0	$\pi/4$	$\pi/2$	$3\pi/4$	π
$\sin(2x)$	0	1	0	-1	0	1	0	-1	0

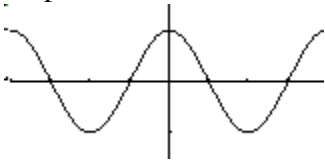
Amplitude = 1 and Period = π



$$f(x) = \cos x$$

x	-2π	$-3\pi/2$	$-\pi$	$-\pi/2$	0	$\pi/2$	π	$3\pi/2$	2π
$\cos(x)$	1	0	-1	0	1	0	-1	0	1

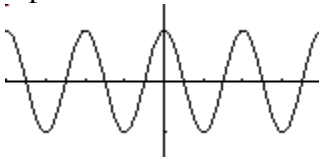
Amplitude = 1 and Period = 2π



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

x	$-\pi$	$-3\pi/4$	$-\pi/2$	$-\pi/4$	0	$\pi/4$	$\pi/2$	$3\pi/4$	π
$\cos(2x)$	1	0	-1	0	1	0	-1	0	1

Amplitude = 1 and Period = π



This curve shape is "sinusoidal"

In radio, we have two primary frequency bands, AM and FM.

Amplitude Modulation and Frequency Modulation

The Amplitude of the Original Sine Curve is 1.

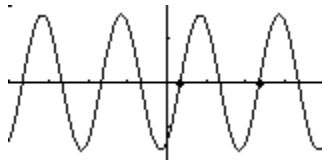
The Period of the Original Sine Curve is 2π .

The Phase Shift of the Original Sine Curve is 0.

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

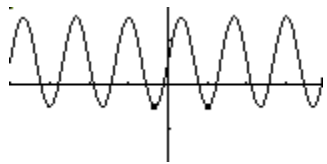
Amplitude = $\frac{3}{2}$ Primary Period Starts at $\frac{\pi}{6}$ = Phase Shift = $\frac{\pi}{6}$ □ Set $2x - \frac{\pi}{3} = 0$, then solve for x.

Primary Period Ends at $x = \frac{7\pi}{6}$ □ Set $2x - \frac{\pi}{3} = 2\pi$, then solve for x



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

Amplitude = 1, Period = $\frac{2\pi}{3}$, Phase Shift = $-\frac{\pi}{6}$, Primary Period End = $\frac{\pi}{2}$, Reflected about x-axis, Raised $\frac{1}{2}$

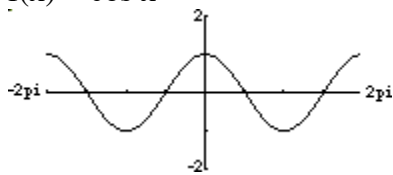


Recall our work with translations:

$f(x) = \left(\frac{3}{5}\right)^x$, $g(x) = -\left(\frac{3}{5}\right)^{x+4}$ What must be done to the graph of $f(x)$ to get the graph of $g(x)$?

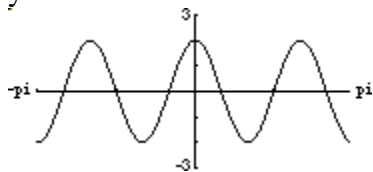
Shift 4 units left and reflect across the x-axis.

1. $f(x) = \cos x$



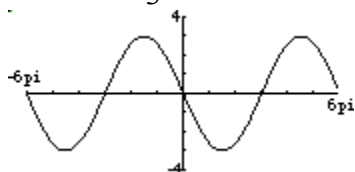
- Find the x-intercepts
- Find the y-intercept
- Find the intervals on which the graph is increasing
- Find the intervals on which the graph is decreasing
- Find the Relative Maximum
- Find the Relative Minimum

2. $y = 2 \cos 3x$



- Find the Period
- Find the Amplitude

3. $y = -3 \sin \frac{x}{3}$



- Find the Period
- Find the Amplitude

4. $y = \frac{1}{4} \cos \frac{2x}{3}$

- Find the Period
- Find the Amplitude

Exer. 5-6: Describe the relationship between the graphs of f and g . Consider amplitudes, periods, and shifts (Phase Shifts).

5. $f(x) = \cos 2x$ $g(x) = -\cos 2x$

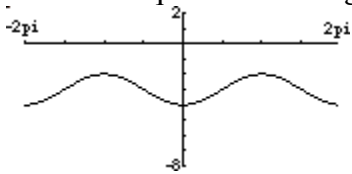
6. $f(x) = \cos 4x$ $g(x) = -6 + \cos 4x$

Exer. 7-8: Sketch the graph of the function by hand. Include two full periods.

7. $y = \sin(x - \pi)$

8. $y = 3 \cos(x + \pi/2)$

9. Write the equation for the graph below in the form of $f(x) = a \cos x + d$



10. Write the equation for the graph below in the form of $f(x) = a \sin(bx - c)$

