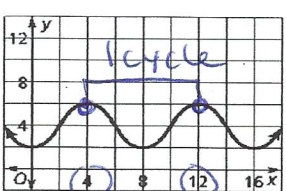
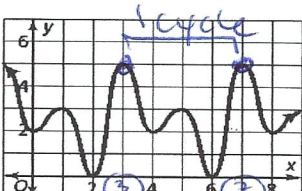
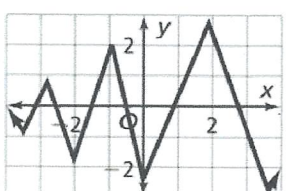
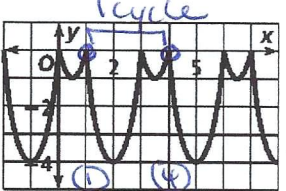


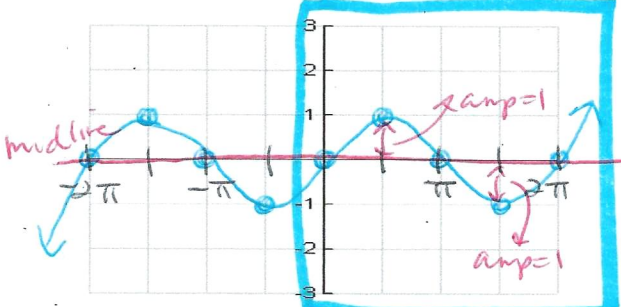
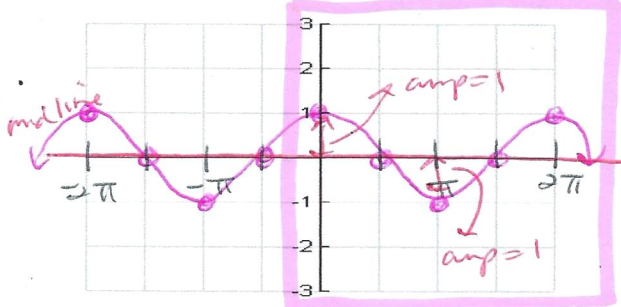
8.3 – Graphing Sine and Cosine Functions

Periodic Function and Period

- One basic property of both the sine and the cosine function → considered periodic
- periodic function** → a function that repeats a pattern of y-values at regular intervals where one cycle = one period.
- period (of a periodic function)** → the horizontal length of one cycle

Example 1: Determine if the given function is periodic. If so, state the period.

<p>a.) </p> <p>Periodic? <u>Yes</u> No</p> <p>Period = <u>8</u></p>	<p>b.) </p> <p>Periodic? <u>Yes</u> No</p> <p>Period = <u>4</u></p>	<p>c.) </p> <p>Periodic? Yes <u>No</u></p> <p>Period = <u>N/A (none)</u></p>	<p>d.) </p> <p>Periodic? <u>Yes</u> No</p> <p>Period = <u>3</u></p>
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Graph of Trig Function # 1 - Sine	Graph of Trig Function # 2 - Cosine																																								
<p>Make a table of domain values between $\pm 2\pi$ for the function of $y = \sin(x)$</p> <table border="1" data-bbox="162 1029 795 1228"> <tbody> <tr> <td>-2π</td> <td>$-\frac{3\pi}{2}$</td> <td>$-\pi$</td> <td>$-\frac{\pi}{2}$</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>-1</td> <td>0</td> </tr> <tr> <td>$\frac{\pi}{2}$</td> <td>π</td> <td>$\frac{3\pi}{2}$</td> <td>2π</td> <td></td> </tr> <tr> <td>1</td> <td>0</td> <td>-1</td> <td>0</td> <td></td> </tr> </tbody> </table> 	-2π	$-\frac{3\pi}{2}$	$-\pi$	$-\frac{\pi}{2}$	0	0	1	0	-1	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π		1	0	-1	0		<p>Make a table of domain values between $\pm 2\pi$ for the function of $y = \cos(x)$</p> <table border="1" data-bbox="844 1029 1461 1228"> <tbody> <tr> <td>-2π</td> <td>$-\frac{3\pi}{2}$</td> <td>$-\pi$</td> <td>$-\frac{\pi}{2}$</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>-1</td> <td>0</td> <td>1</td> </tr> <tr> <td>$\frac{\pi}{2}$</td> <td>π</td> <td>$\frac{3\pi}{2}$</td> <td>2π</td> <td></td> </tr> <tr> <td>0</td> <td>-1</td> <td>0</td> <td>1</td> <td></td> </tr> </tbody> </table> 	-2π	$-\frac{3\pi}{2}$	$-\pi$	$-\frac{\pi}{2}$	0	1	0	-1	0	1	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π		0	-1	0	1	
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Graphing the Sine / Cosine Function: $y = f(x) = a \sin(bx \pm c) \pm d$ or $y = f(x) = a \cos(bx \pm c) \pm d$

Each parameter (letter) affects the graph of $y = a \sin/\cos(bx \pm c) \pm d$ differently:

* amp does not affect things as a fox

- Parameter a affects the range of $f(x)$ where |a| is called the amplitude
- Parameter b affects the period of $f(x)$ where the period = $\frac{2\pi}{b}$
- Parameter c affects the horizontal (phase) shift of $f(x)$ where phase shift = $-\frac{c}{b}$
 - If $-\frac{c}{b} < 0$ then the graph shifts to the left
 - If $-\frac{c}{b} > 0$ then the graph shifts to the right
- Parameter d affects the vertical shift of $f(x)$
 - If $d < 0$ then the graph shifts down
 - If $d > 0$ then the graph shifts up

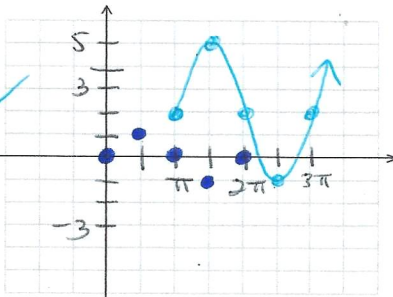
Example 2: State the amplitude, period, and phase shift of each function.

Function	Amplitude	Period	Phase Shift	Vertical Shift
a.) $y = 3 \sin(2x) + 1$ <u>a</u> <u>b</u> <u>c=0</u> <u>d</u>	$ 3 = 3$	$\frac{2\pi}{2} = \pi$	none	up 1
b.) $y = -2 \cos\left(x + \frac{\pi}{2}\right) + 0$ <u>a</u> <u>b</u> <u>c</u> <u>d=0</u>	$ -2 = 2$	$\frac{2\pi}{1} = 2\pi$	$-\frac{\pi}{2} = -\frac{\pi}{2}$ (left $\frac{\pi}{2}$)	none
c.) $y = \sin(4x - \pi) - 3$ <u>a</u> <u>b</u> <u>c</u> <u>d</u>	$ 1 = 1$	$\frac{2\pi}{4} = \frac{\pi}{2}$	$\frac{\pi}{4}$ (right $\frac{\pi}{4}$)	down 3
d.) $y = \frac{1}{2} \cos\left(\frac{1}{4}x + \pi\right) + 2$ <u>a</u> <u>b</u> <u>c</u> <u>d</u>	$ \frac{1}{2} = \frac{1}{2}$	$\frac{2\pi}{1/4} = 8\pi$	$-\frac{\pi}{1/4} = -4\pi$ (left 4π)	up 2

Example 3: Graph each function by finding the amplitude, period, phase shift, and vertical shift.

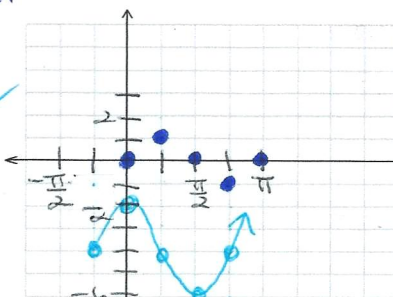
a.) $y = 3 \sin(x - \pi) + 2$
a b c d

amp = $|3| = 3$
period = $\frac{2\pi}{1} = 2\pi$
phase shift = $\frac{\pi}{1} = \pi$ (right π)
v. shift = up 2



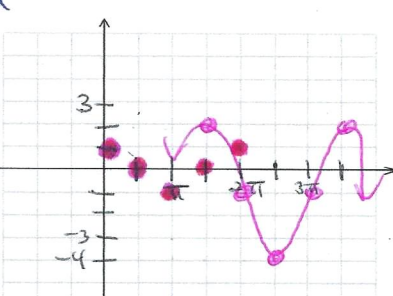
b.) $y = 2 \sin\left(2x + \frac{\pi}{2}\right) - 4$
a b c d

amp = $|2| = 2$
period = $\frac{2\pi}{2} = \pi$
phase shift = $-\frac{\pi/2}{2} = -\frac{\pi}{4}$ (left $\frac{\pi}{4}$)
v. shift = down 4



c.) $y = 3 \cos\left(x - \frac{3\pi}{2}\right) - 1$
a b c d

amp = $|3| = 3$
period = $\frac{2\pi}{1} = 2\pi$
phase shift = $\frac{3\pi/2}{1} = \frac{3\pi}{2}$ (right $\frac{3\pi}{2}$)
v. shift = down 1



d.) $y = 4 \cos\left(\frac{1}{2}x + \pi\right) + 1$
a b c d

amp = $|4| = 4$
period = $\frac{2\pi}{1/2} = 4\pi$
phase shift = $-\frac{\pi}{1/2} = -2\pi$ (left 2π)
v. shift = up 1

