

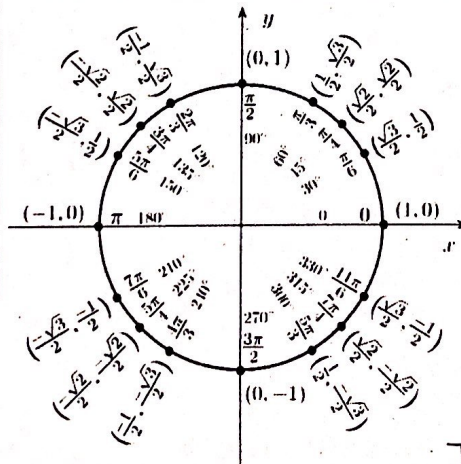
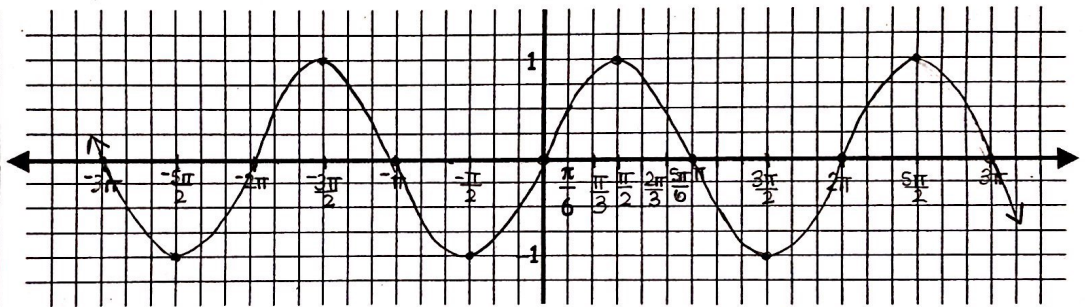
Name: _____ Class Period: _____

Precalculus - Unit 1 Day 6 Graphs of Sine and Cosine Functions

Graph the sine function. First complete the x-y chart by listing the corresponding radian measure for each degree measure. Strategically select angles (inputs) that have rational output values. Then, determine the y-value (output) for each x-value (input). Notice the pattern and continue graphing until the entire grid is filled. Use the unit circle to help you complete the table.

$y = \sin(x)$

x radians	x degrees	y
-3π	-540°	0
$-\frac{5\pi}{2}$	-450°	-1
-2π	-360°	0
$-\frac{3\pi}{2}$	-270°	1
$-\pi$	-180°	0
$-\frac{\pi}{2}$	-90°	-1
0	0°	0
$\frac{\pi}{2}$	90°	1
π	180°	0
$\frac{3\pi}{2}$	270°	-1
2π	360°	0
$\frac{5\pi}{2}$	450°	1
3π	540°	0



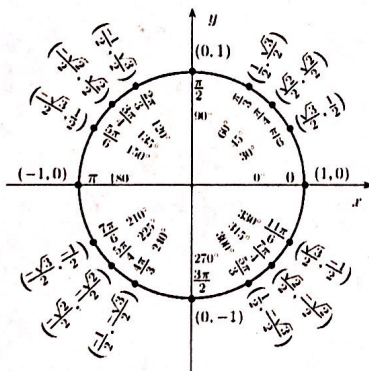
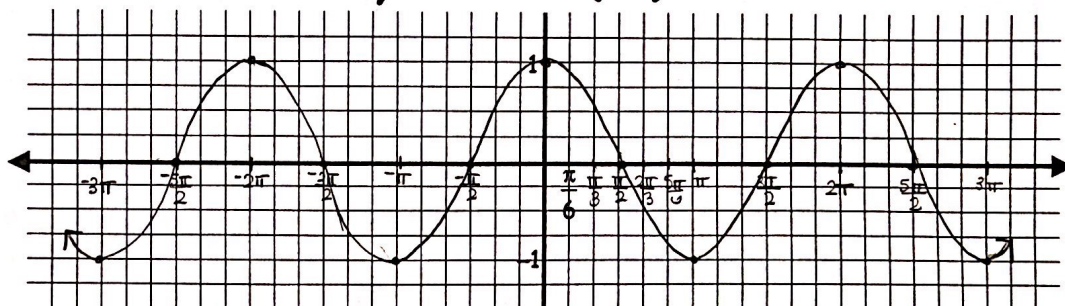
- Domain: $(-\infty, \infty)$ left, right
- Range: $[-1, 1]$ down, up
- Period is the length of **ONE CYCLE**
Determine how many radians it takes before the sine curve starts to repeat?
Period: 2π
- Amplitude is the **height** of the wave from the **midline**. For this parent function, the midline is the x-axis.
Amplitude: 1

Important Values: $\frac{\pi}{2}$

Now, do the same thing for the Cosine Function.

$$y = \cos(x)$$

x radians	x degrees	y
-3π	-540°	-1
$-\frac{5\pi}{2}$	-450°	0
-2π	-360°	1
$-\frac{3\pi}{2}$	-270°	0
$-\pi$	-180°	-1
$-\frac{\pi}{2}$	-90°	0
0	0°	1
$\frac{\pi}{2}$	90°	0
π	180°	-1
$\frac{3\pi}{2}$	270°	0
2π	360°	1
$\frac{5\pi}{2}$	450°	0
3π	540°	-1



➤ Domain: $(-\infty, \infty)$

➤ Range: $[-1, 1]$

➤ Period: 2π

➤ Amplitude: 1

Important Values: $\frac{\pi}{2}$

Note: Functions that behave in such a repetitive (or cyclical) manner are called periodic. The graphs of the sine and cosine functions are also known as Sinusoidal (wave) graphs.

Describe the transformation(s) that occurred to the parent function, $y = \sin x$.

1. $y = 2\sin x$ Vertical stretch by a factor of 2	2. $y = -\frac{1}{3}\sin x$ reflection over x-axis vertical compression by a factor of 3	3. $y = \sin(x+1)$ horizontal translation left 1
4. $y = \sin x + 2$ Vertical translation up 2	5. $y = \sin(2x)$ horizontal compression by a factor of 2	6. $y = \sin\frac{x}{4}$ horizontal stretch by a factor of 4

Vertical stretch/compress

$$y = -a(-bx \pm h) \pm k$$

vertical translation up/down

reflection over X-axis

reflection over y-axis

horizontal translation right/left

horizontal stretch/compress

amplitude

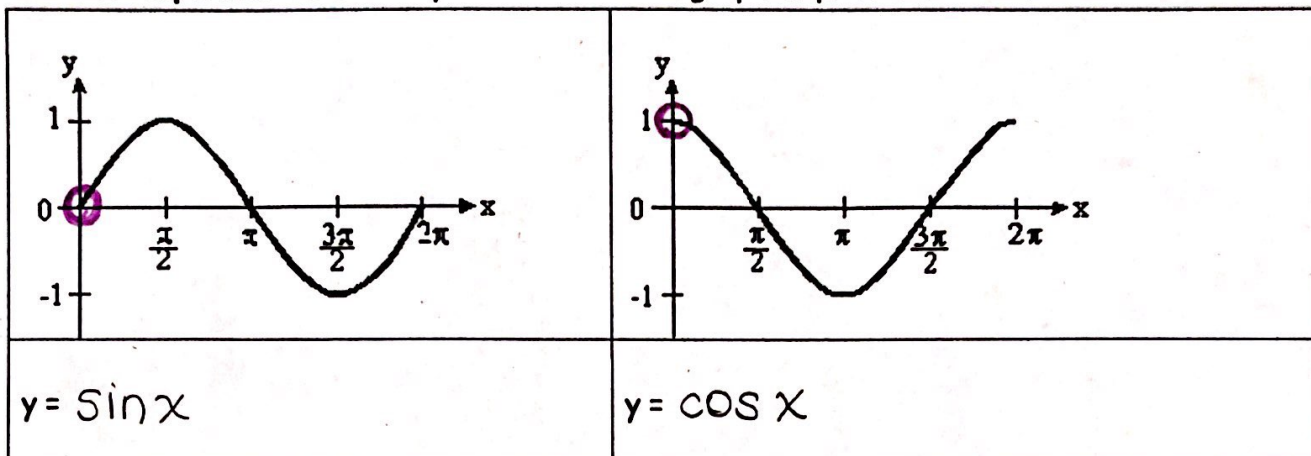
helps us to find the phase shift = $\frac{c}{b}$

$$y = -a \sin(-bx \pm c) \pm d$$

midline

helps us find the period = $\frac{2\pi}{b}$

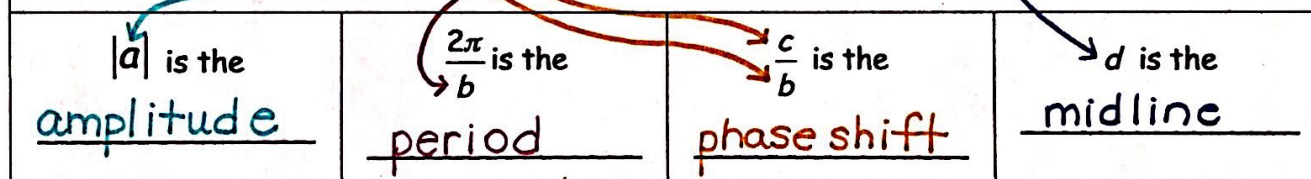
Use your knowledge of transformations to graph each of the following trigonometric functions. One period of the sine and cosine function are graphed below. Identify which one is which and use the "important values" as you translate each graph in questions #1-10.



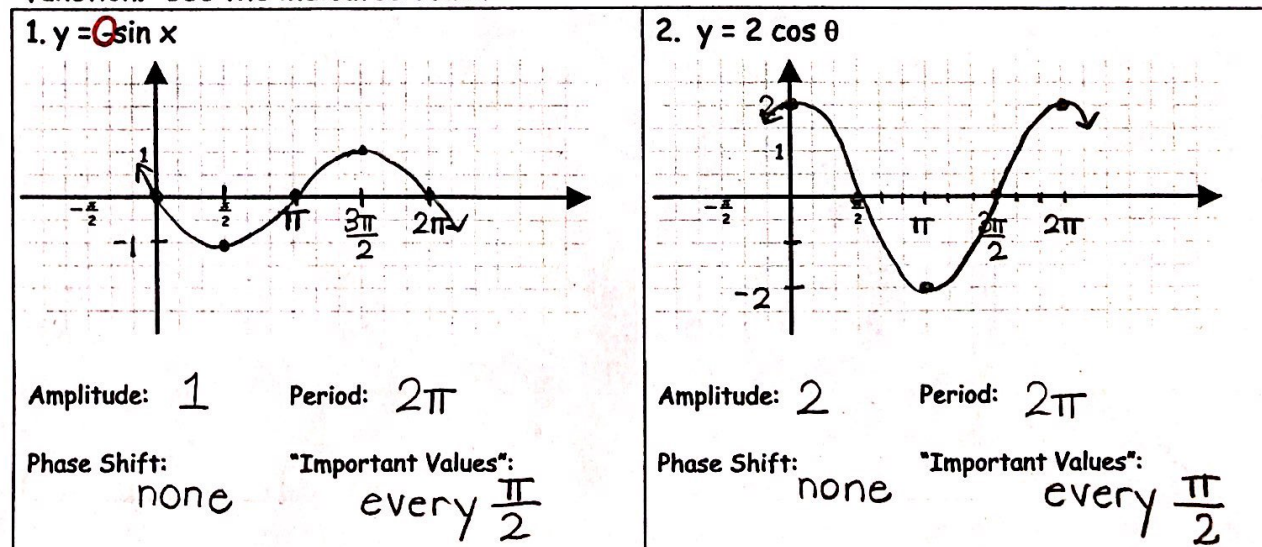
The "important values" are where the peaks, valleys and intercepts occur. The peaks and valleys are your relative extrema. For the sine and cosine function, these values happen every $\frac{\pi}{2}$ radians.

The general equations for the sinusoidal functions are:

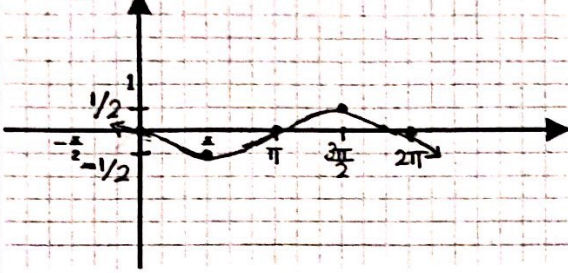
$$y = a \sin(bx - c) + d \quad \text{and} \quad y = a \cos(bx - c) + d$$



Graph each of the following functions. Be sure to include all relative extrema and intercepts. Include at least ONE period for each function. List the amplitude and the period for each function. Use the indicated scale.

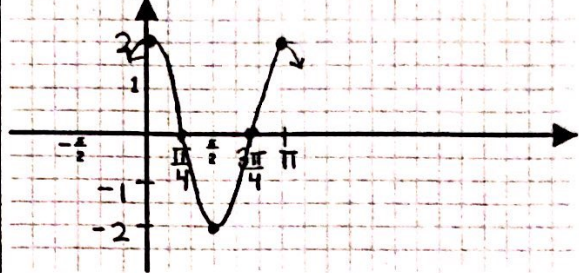


3. $y = \frac{1}{2} \sin(\theta)$



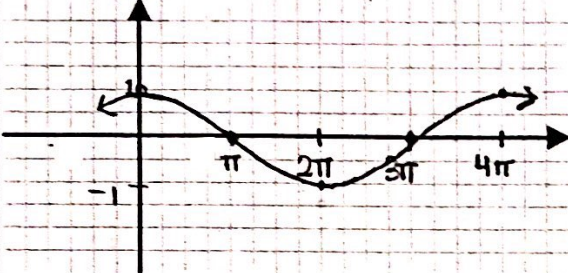
Amplitude: $\frac{1}{2}$ Period: 2π
 Phase Shift: none "Important Values": $\frac{\pi}{2}$ every $\frac{\pi}{2}$

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



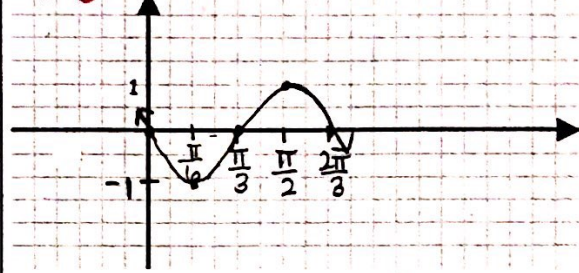
Amplitude: 1 Period: $\frac{2\pi}{2} = \pi$
 Phase Shift: none "Important Values": $\frac{\pi}{4}$ every $\frac{\pi}{4}$

5. $y = \cos(\frac{1}{2}x)$



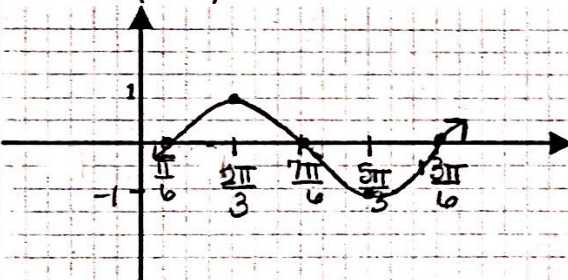
Amplitude: 1 Period: $\frac{2\pi}{1/2} = 4\pi$
 Phase Shift: none "Important Values": π every π

6. $y = \sin(3\theta)$



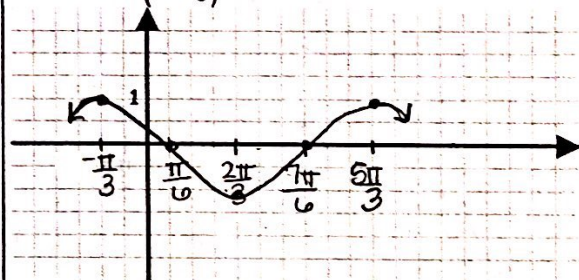
Amplitude: 1 Period: $\frac{2\pi}{3}$
 Phase Shift: none "Important Values": $\frac{\pi}{6}$ every $\frac{\pi}{6}$

7. $y = \sin(x - \frac{\pi}{6})$



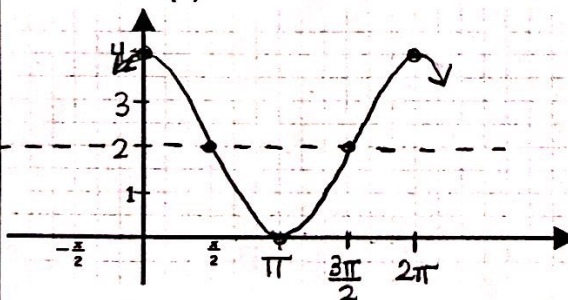
Amplitude: 1 Period: 2π
 Phase Shift: $\frac{\pi}{6} = \frac{\pi}{6}$ "Important Values": $\frac{\pi}{2}$ every $\frac{\pi}{2}$

8. $y = \cos(\theta + \frac{\pi}{3})$



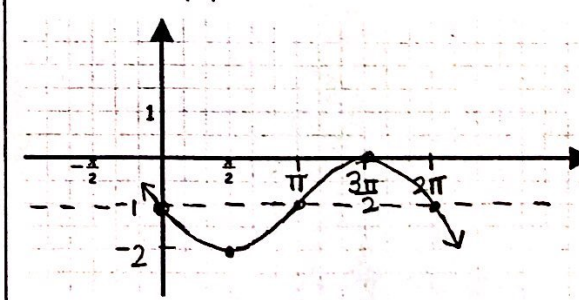
Amplitude: 1 Period: 2π
 Phase Shift: $\frac{\pi}{3} = \frac{\pi}{3}$ "Important Values": $\frac{\pi}{2}$ every $\frac{\pi}{2}$

9. $y = 2\cos(\theta) + 2$



Amplitude: 2 Period: 2π
 Phase Shift: none Vertical Shift: up 2
 Imp Val: every $\frac{\pi}{2}$

10. $y = -\sin(x) - 1$



Amplitude: 1 Period: 2π
 Phase Shift: none Vertical Shift: down 1
 Imp Val: every $\frac{\pi}{2}$

Identify the amplitude and period for each of the following functions.

1. $y = 2\sin\left(\frac{1}{2}x\right) + 4$

Period = $\frac{2\pi}{\frac{1}{2}} = 4\pi$

Amp: 2 Per: 4π

2. $y = -8\sin(6x)$

Period = $\frac{2\pi}{6} = \frac{\pi}{3}$

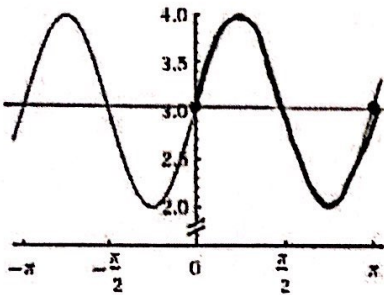
Amp: 8 Per: $\frac{\pi}{3}$

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

Period = $\frac{2\pi}{\frac{2}{5}} = \frac{2\pi}{1} \cdot \frac{5}{2}$

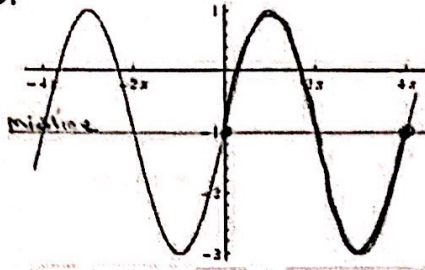
Amp: 1 Per: 5π

4.



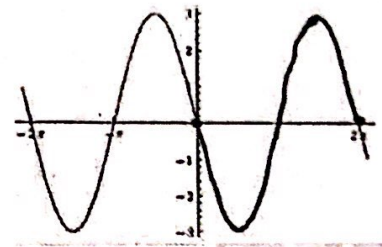
Amp: 1 Per: π

5.



Amp: 2 Per: 4π

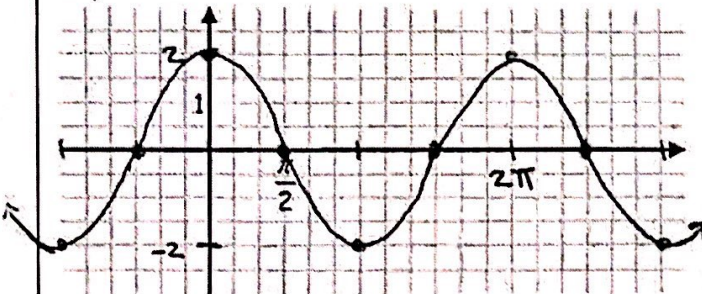
6.



Amp: 3 Per: 2π

Graph each of the functions. Be sure to include all relative extrema and intercepts. Graph as many periods of the function that will fit on the grid provided. List the requested information for each function.

7. $y = 2\cos x$

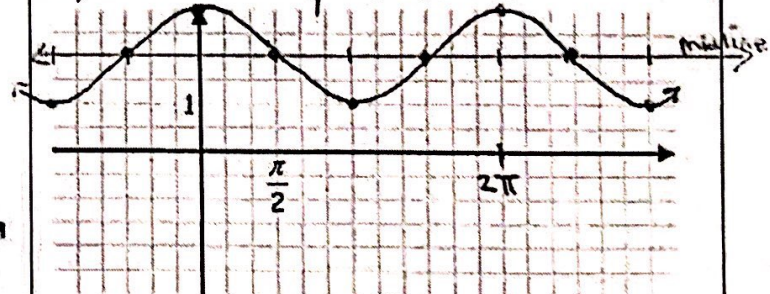


Imp. Values: every $\frac{\pi}{2}$

Amp: 2 Per: 2π PS: 0 VS: 0

8. $y = 2 + \cos x$

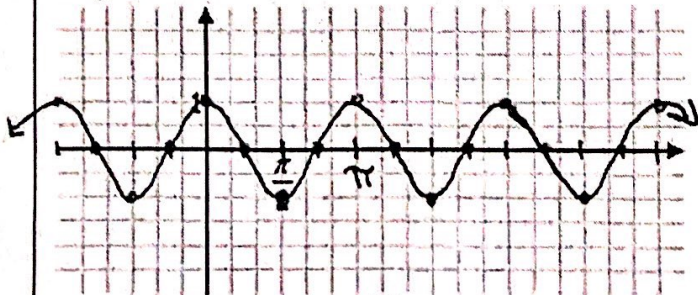
$y = \cos x + 2$



Imp. Values: every $\frac{\pi}{2}$

Amp: 1 Per: 2π PS: 0 VS: 2

9. $y = \cos 2x$ Horiz. compression

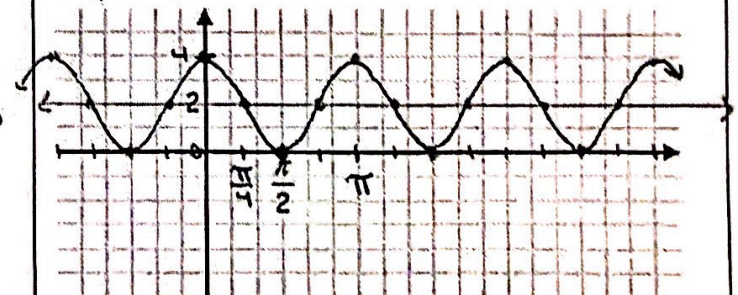


Imp. Values: every $\frac{\pi}{4}$

Amp: 1 Per: π PS: 0 VS: 0

$\frac{2\pi}{2} = \pi$

10. $y = 2 + 2\cos 2x$

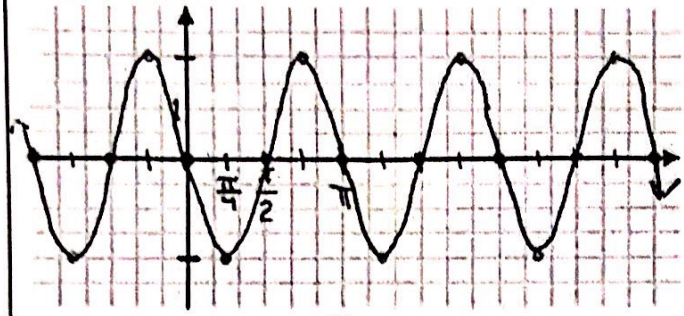


Imp. Values: every $\frac{\pi}{4}$

Amp: 2 Per: π PS: 0 VS: 2

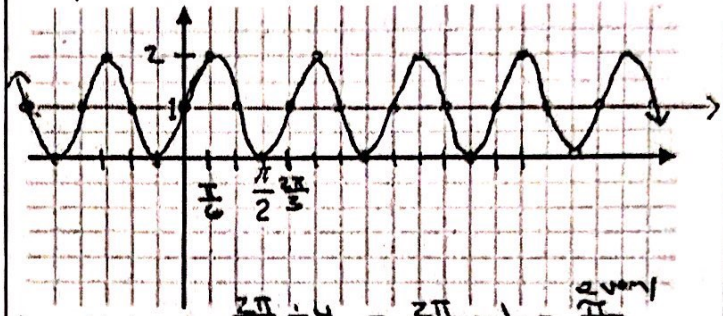
$\frac{2\pi}{2}$

11. $y = -2\sin(2x)$ * Reflected



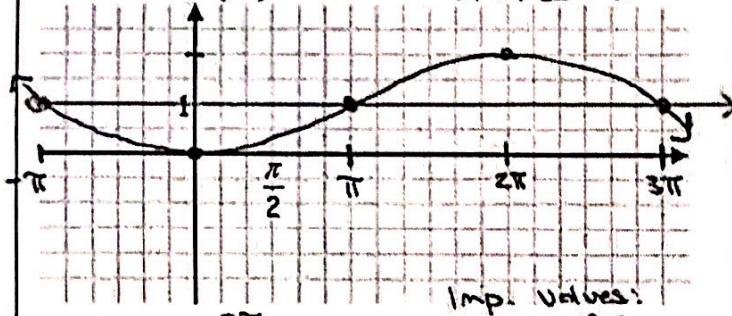
Imp. Values: every $\frac{\pi}{2}$
 Amp: 2 Per: π PS: 0 VS: 0

12. $y = \sin(3x) + 1$



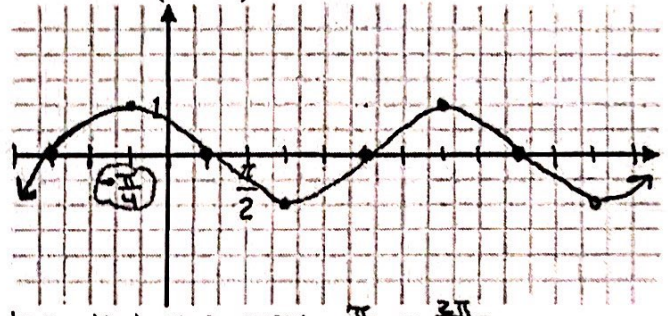
Imp. Values: $\frac{2\pi}{3} \div 4 = \frac{2\pi}{3} \cdot \frac{1}{4} = \frac{\pi}{6}$ every
 Amp: 1 Per: $\frac{2\pi}{3}$ PS: 0 VS: 1

13. $y = 1 - \cos\left(\frac{x}{2}\right)$ $y = -\cos\left(\frac{x}{2}\right) + 1$ * Reflected



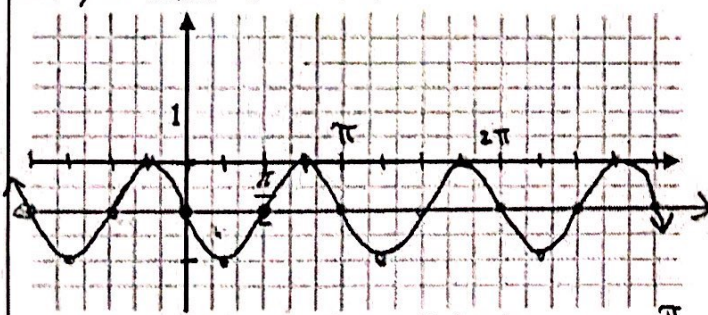
Imp. Values: every π
 $\frac{2\pi}{\frac{1}{2}} = 2\pi \cdot 2$
 Amp: 1 Per: 4π PS: 0 VS: 1

14. $y = \cos\left(x + \frac{\pi}{4}\right)$



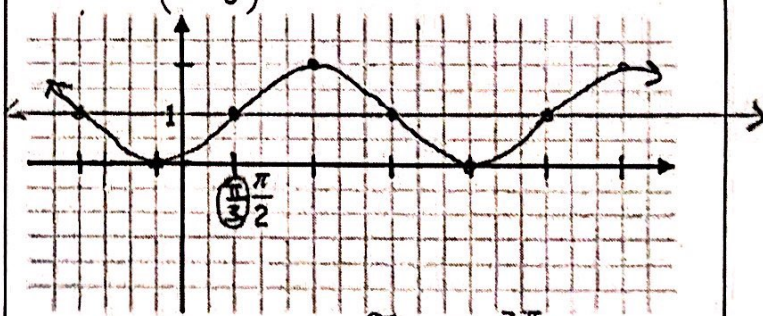
Imp. Values: every $\frac{\pi}{2} = \frac{2\pi}{4}$
 Amp: 1 Per: 2π PS: $-\frac{\pi}{4}$ VS: 0

15. $y = -\sin 2x - 1$ * Reflected



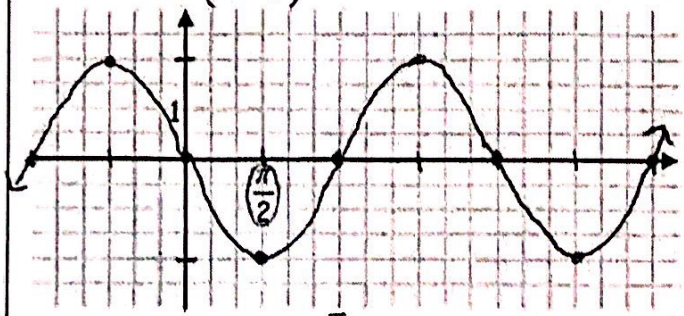
Imp. Values: every $\frac{\pi}{2}$
 $\frac{2\pi}{2} \approx \pi$
 Amp: 1 Per: π PS: 0 VS: -1

16. $y = \sin\left(x - \frac{\pi}{3}\right) + 1$



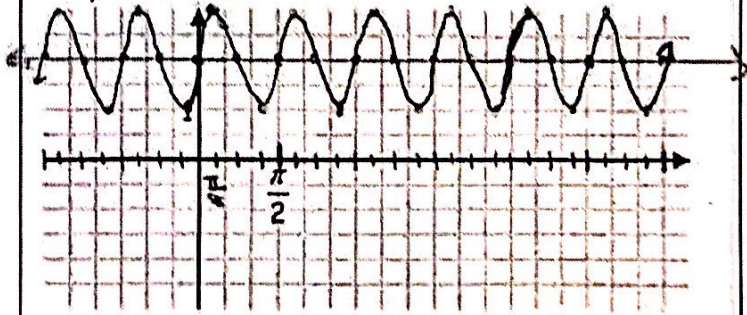
Imp. Values every $\frac{\pi}{2}$ or $\frac{3\pi}{6}$
 Amp: 1 Per: 2π PS: $\frac{\pi}{3}$ VS: 1

17. $y = -2\cos\left(x - \frac{\pi}{2}\right)$ * Reflected



Imp. Values: every $\frac{\pi}{2}$
 Amp: 2 Per: 2π PS: $\frac{\pi}{2}$ VS: 0

18. $y = 2 + \sin 4x$



Imp. Values: every $\frac{\pi}{2}$
 $\frac{2\pi}{4} \approx \frac{\pi}{2}$
 Amp: 1 Per: $\frac{\pi}{2}$ PS: 0 VS: 2