3.3 Sinusoidal Functions

Sinusoidal functions

$y = a \cdot \sin(bx + c) + d$

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

a = amplitude (radius)

b = used to find period

$P = \frac{2\pi}{b}$ $P = \frac{360^\circ}{b}$

C = phase shift

(x+c) move left

(x-c) move right

d = midline

range: max d+a
min d-a

min ≤ y ≤ max

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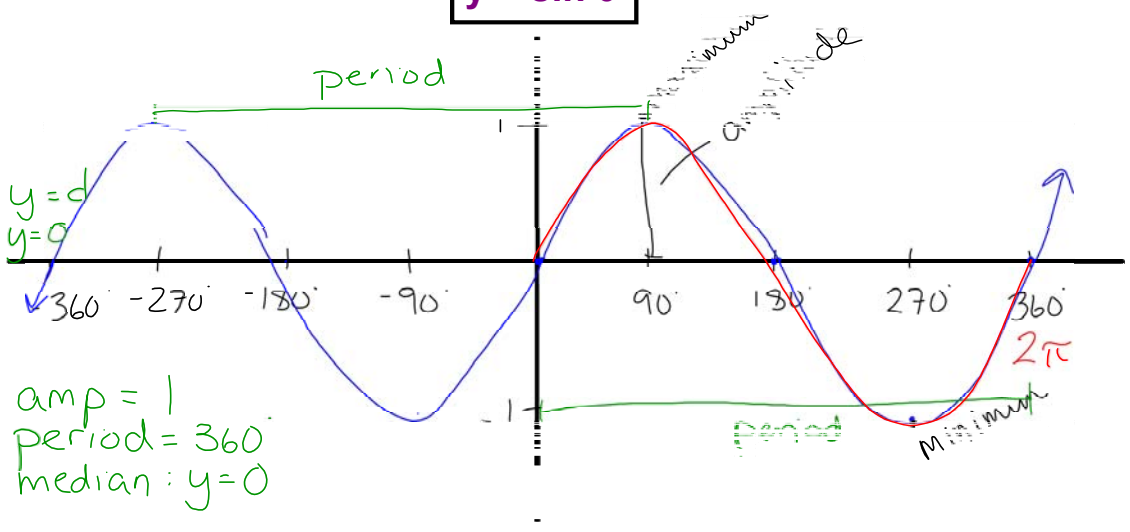
y = sin θ



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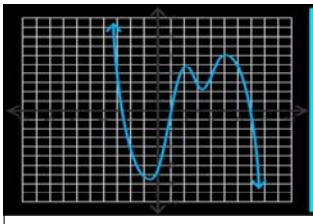
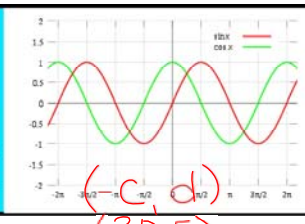


$y = a\sin(bx + c) + d$

$P = \frac{2\pi}{b}$ $P = \frac{360^\circ}{b}$



$(-c, d)$ $(30, 5)$

Ex.) Find the range, period, equation of the midline, amplitude, and starting point of:

a) $y = 2\sin(x - 30^\circ) + 5$

a d right 30°

max: $d + a = 5 + 2 = 7$

min: $d - a = 5 - 2 = 3$

range: $3 \le y \le 7$

amp $= 2$

Period: 360°

Midline: $y = 5$

$P = \frac{360^\circ}{b} = \frac{360}{1} = 360$

b) $y = 5\sin(\frac{1}{2}(x - 6.28)) - 3$

max: $d + a = -3 + 5 = 2$

min: $d - a = -3 - 5 = -8$

range: $-8 \le y \le 2$

$P = \frac{2\pi}{b} = \frac{2\pi}{1/2} = 2\pi \times 2 = \boxed{4\pi}$

Midline: $y = -3$

Amp: 5

Starting Point: $(6.28, -3)$

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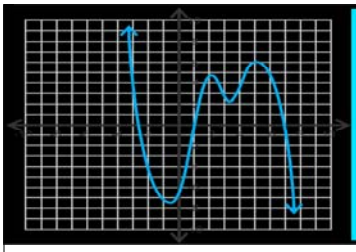

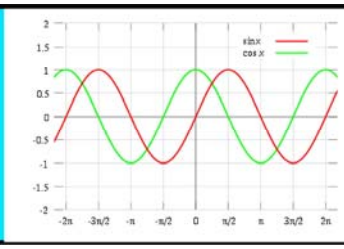

Ex.) Find the equation of each graph on the worksheet.

Pg. 508 # 6.

Worksheet on pg. 5, 9 use for notes.

Homework Pg. 508 and other worksheets.

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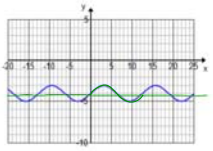
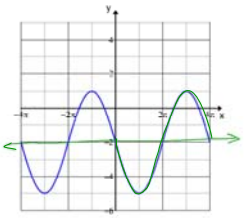
Lesson 3: The Graphs of Sinusoidal Functions and Equations

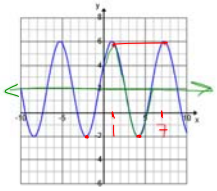
Complete the below tables for each graph



Amplitude	1
Equation of Midline	$y=-4$
Range	$-5 \le y \le -3$
Period	12.5



Amplitude	3
Equation of Midline	$y=-2$
Range	$-5 \le y \le 1$
Period	4π



Amplitude	4
Equation of Midline	$y=2$
Range	$-2 \le y \le 6$
Period	6

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Sinusoidal Equation: $y = a\sin b(x-c)+d$

a = amplitude

b = related to period $P=\frac{2\pi}{b}$ $P=\frac{360}{b}$

c = phase shift

d = midline $y=d$

max $d+a$
min $d-a$ } range $\min \le y \le \max$

1. Complete the following table using each equation.

	$y=\frac{1}{2}\sin 3(x-4)+0$ (a b c)	$y=4\sin\frac{\pi}{2}(x+1)-9$
Amplitude/ ~~Vertical Stretch~~	$\frac{1}{2}$	4
Period	$\frac{2\pi}{3}$	4
Phase Shift	4 right	1 left
~~Vertical~~ ~~Displacement~~ midline	$y=0$	$y=-9$
Starting point	(4,0)	(-1, -9)

$P=\frac{2\pi}{b}=\frac{2\pi}{3}$

$P=\frac{2\pi}{1}\div\frac{\pi}{2}$

$\frac{2\pi}{1}\cdot\frac{2}{\pi}=4$ (-c, d)

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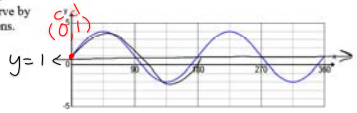
2. Determine the equation that will produce the given sinusoidal curve by answering the following questions.



a. Determine the value of 'a':

$a = 3$

b. Find the value of 'b':

$P = \frac{360°}{b}$ $\quad b = \frac{360°}{P} = \frac{360°}{180°} = 2$

c. Find the 'c' value for a sine function.

$c = 0$ no phase shift

on midline & going up

d. Determine the value of 'd':

$d = 1$

e. Determine a sine equation that will produce the above graph. Verify on your calculator.

$y = a\sin b(x-c) + d$

$y = 3\sin(2x) + 1$

$y = 3\sin 2x + 1$

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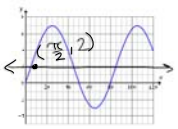
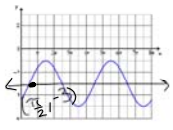
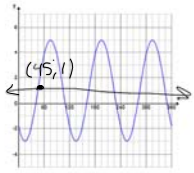
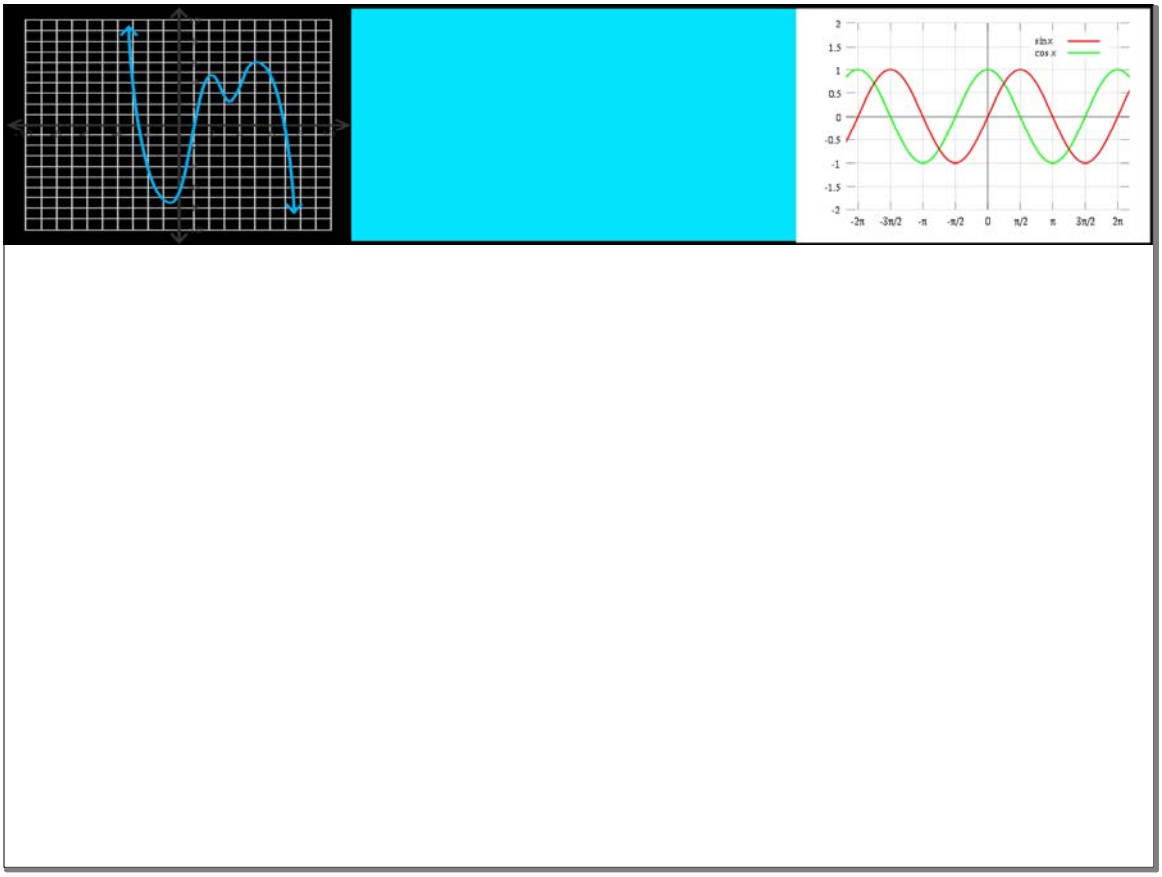
Determine an equation of each graph below.

Graph	Characteristics	Equation
	a = 5 b = 1/4 c = π/2 d = 2 period P = 8π b = 2π/8π = 1/4	$y = 5\sin\frac{1}{4}(x-\frac{\pi}{2})+2$
	a = 2 b = 1/2 c = π/2 d = -3 period b = 2π/P = 2π/4π = 1/2	$y = 2\sin\frac{1}{2}(x-\frac{\pi}{2})-3$
	a = 4 b = 3 c = 45° d = 1 period b = 360/120 = 3	$y = 4\sin 3(x-45)+1$



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