

HOMEWORK 8-5

See the graphs on the following slides...

Show me both HW 8-5 & HW 8-4 from yesterday

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Name: Kuy

Algebra 2 Homework 8-5

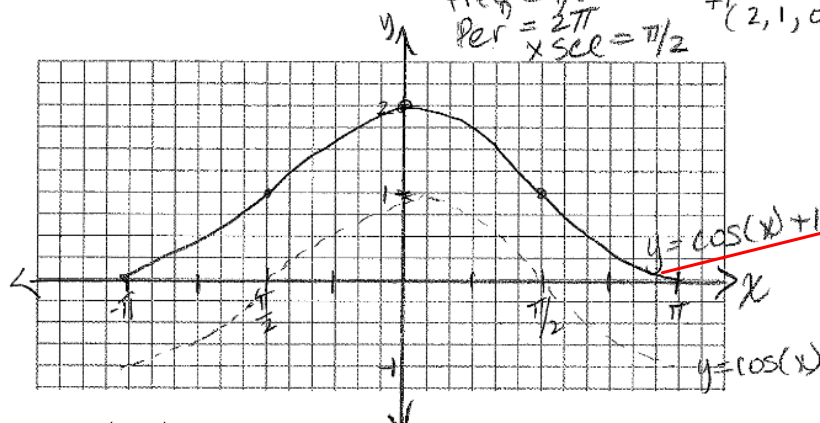
Period: _____

1. Graph $f(x) = \cos(x) + 1$ for $-\pi \leq x \leq \pi$. Show all work as done in class.

$$y = \cos(x) \quad \text{up } 1$$

$$\begin{aligned} \text{amp} &= 1 \\ \text{range} &= [0, 2] \\ \text{freq} &= 1/2\pi \\ \text{Per} &= 2\pi \\ x\text{ sec} &= \pi/2 \end{aligned}$$

$$\begin{aligned} &(1, 0, -1, 0, 1) \\ &+ (2, 1, 0, 1, 2) \end{aligned}$$



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2. Graph $f(x) = -3 \sin\left(x - \frac{\pi}{2}\right)$ for $0 \leq x \leq 2\pi$. Show all work as done in class.

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

$$\text{amp} = 3$$

$$\text{range} = [-3, 3]$$

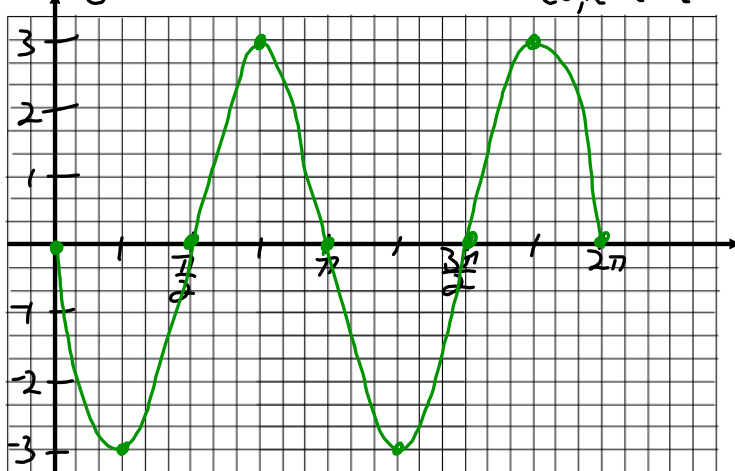
$$\text{freq} = \frac{2}{2\pi} \text{ or } \frac{1}{\pi}$$

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

$$\text{Xscl} = \pi/4$$

$$A(0, 1, 0, -1, 0)$$

$$= -3(0, 1, 0, -1, 0) = (0, -3, 0, 3, 0)$$



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3. Graph $f(x) = \cos\left(x - \frac{\pi}{2}\right) - 2$ for $0 \leq x \leq 2\pi$. Show all work as done in class.

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

$$\text{amp} = |1| = 1$$

$$\text{range} = [-3, -1]$$

$$\text{freq} = \frac{1}{2\pi} = \frac{1}{2\pi}$$

$$\text{per} = \frac{2\pi}{1} = 2\pi$$

$$\text{Xscl} = \frac{\text{per}}{4} = \frac{2\pi}{4} = \frac{\pi}{2}$$

vertical shift down 2

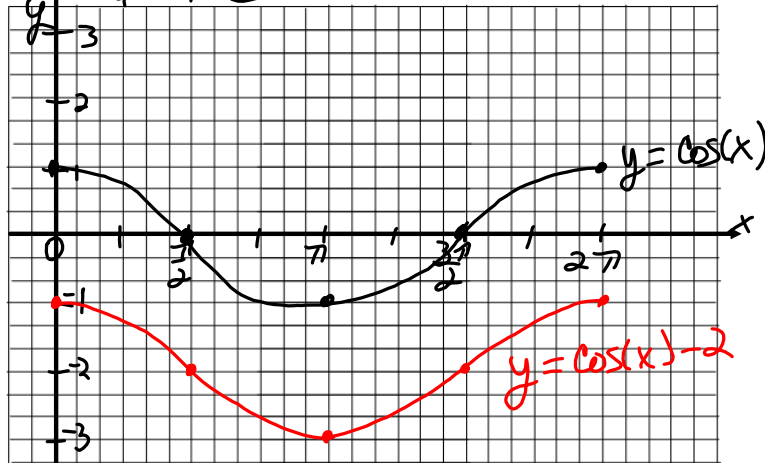
$$y = -2$$

$$y = -1$$

$$y = -3$$

$$y = \cos(x) \quad (1, 0, -1, 0, 1)$$

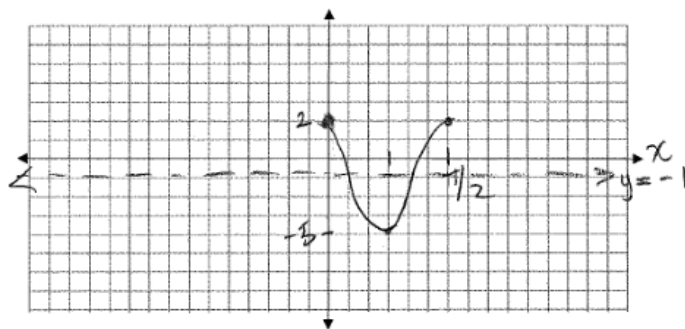
$$y = \cos(x) - 2$$



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4. (*) On the set of axes below, graph one cycle of a cosine function with amplitude 3, period $\frac{\pi}{2}$, midline $y = -1$, and passing through the point $(0, 2)$.

$$|W| = \frac{2\pi / \frac{\pi}{2}}{2} = 2\pi \left(\frac{2}{\pi} \right) = 4$$



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Go to end of Day 5 Notes

$$f(x) = A \sin(\omega(x-h)) + K$$

3. Describe the graph for $f(x) = 5 + 2\sin(x + 3)$.

Amplitude: 2

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

Phase Shift: $1\pi + 3$

Vertical Shift: up 5 (midline)

Minimum: 3

Maximum: 7

range: $[3, 7]$

$$5 \begin{array}{c} \uparrow +2 \\ \downarrow -2 \\ 3 \end{array}$$

4. Describe the graph for $f(x) = 30 \cos \frac{\pi}{2}(x - 15) - 75$.

Amplitude: 30

Period: $\frac{2\pi}{\frac{\pi}{2}} = 2\pi \cdot \frac{2}{\pi} = 4$

Phase Shift: 15 right

Vertical Shift: 75 down

Minimum: -45

Maximum: -15

range $[-45, -15]$

$$-75 \begin{array}{c} \uparrow +30 \\ \downarrow -30 \end{array}$$

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Day 6: Writing Equations of Trig Graphs

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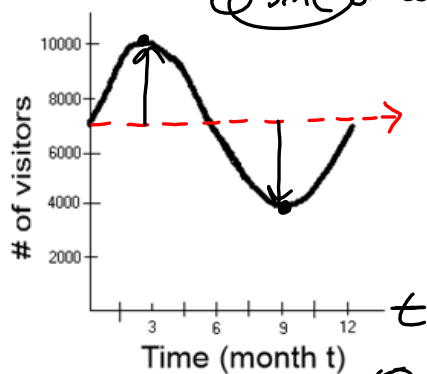
Vertical Shifts

$$f(x) = A \cos(\omega x) + k \quad \text{or} \quad f(x) = A \sin(\omega x) + k$$

where k is the midline (vertical shift)

Example

The number of visitors at a resort rises and falls during the year according to the accompanying graph. Determine an equation of this graph in terms of the month number, t .



(1) Sine or cosine

(2) $K = \text{midline} = \frac{\text{max} + \text{min}}{2}$
 $= \frac{10,000 + 4,000}{2} = \frac{14,000}{2} = 7,000 = k$

(3) $\text{Amplitude} = \text{max} - \text{middle}$
 $= 10,000 - 7,000 = 3,000 = A$

(4) $\frac{w}{\cancel{w}} \text{ Period} = \frac{2\pi}{w} = \frac{12}{1}$
 $\frac{2\pi}{12} = \frac{12w}{12}$
 $w = \frac{\pi}{6}$

(5) $f(t) = A \sin(\omega t) + k$
 $f(t) = 3000 \left(\frac{\pi}{6} t \right) + 7000$

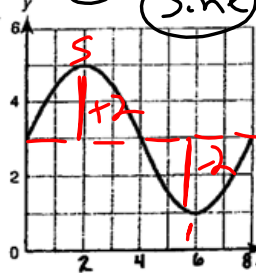
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Writing equations of Trig Graphs

$$f(x) = A \cos(\omega x) + k \quad \text{or} \quad f(x) = A \sin(\omega x) + k$$

If each of the following graphs represents a vertical translation of basic sine or cosine curve, write an equation of the translated graph shown:

1.



(1) Sine or cosine (2) $k = \text{middle} = \frac{5+1}{2} = \frac{6}{2} = 3 = k$

(3) $\text{Ampl} = \text{max} - \text{middle} = 5 - 3 = 2 = A$

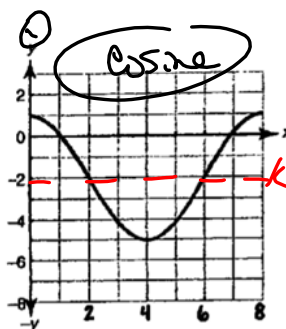
(4) $w: \text{Per} = \frac{2\pi}{w} = \frac{8}{1}$

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

$\frac{8w}{8} = \frac{2\pi}{8}$

$w = \pi/4$

2.



(2) $k = \frac{\text{max} + \text{min}}{2} = \frac{1 + (-5)}{2} = \frac{-4}{2} = -2$

(3) $\text{Ampl} = \text{max} - \text{middle} = 1 - (-2) = 3 = A$

(4) $w: \text{Per} = \frac{2\pi}{w} = \frac{8}{1}$

$2\pi = 8w$
 $w = \frac{\pi}{4}$

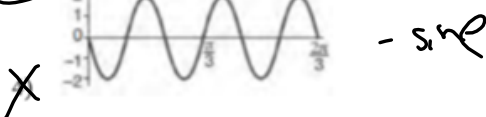
(5) $f(x) = 3 \cos\left(\frac{\pi}{4}x\right) - 2$

$A=3, A=-3$

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3. Regents Question: January 2017

Which graph represents a cosine function with no horizontal shift, an amplitude of 2, and a period of $\frac{2\pi}{3}$?



$\frac{2\pi}{3}$

$\text{freq} = \frac{3}{2\pi}$

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Regents Question:

4. The voltage used by most households can be modeled by a sine function. The maximum voltage is 120 volts, and there are 60 cycles every second. Which equation best represents the value of the voltage as it flows through the electric wires, where t is the time in seconds?

a. $V = 120 \sin(t)$
 c. $V = 120 \sin(60t)$

b. $V = 120 \sin(60\pi t)$

d. $V = 120 \sin(120\pi t)$

$\max = 120$
 $\min = 0$
 60 cycles / second
 period = $\frac{1}{60}$ second

$\text{period} = \frac{1}{60} = \frac{2\pi}{\omega}$
 $\omega = 2\pi(60)$
 $\omega = 120\pi$

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5. An athlete was having her blood pressure monitored during a workout. Doctors found that her maximum blood pressure, known as systolic, was 110 and her minimum blood pressure, known as diastolic, was 70. If each heartbeat cycle takes 0.75 seconds, then determine a sinusoidal model, in the form $f(t) = A \sin(Bt) + C$, for her blood pressure as a function of time t in seconds. Show the calculations that lead to your answer.

$\max = 110$
 $\min = 70$
 $A =$
 $k = \frac{110 + 70}{2} = \frac{180}{2} = 90$
 $\text{per} = .75 = \frac{2\pi}{\omega} = \frac{3}{4}$
 $\frac{8\pi}{3} = \frac{3\omega}{3}$
 $\omega = \frac{8\pi}{3}$
 $f(t) = 20 \sin\left(\frac{8\pi}{3}t\right) + 90$
 $\omega = \frac{8\pi}{3}$
 $90 \begin{array}{c} \uparrow 20 \\ \downarrow 20 \\ 70 \end{array}$

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