HOMEWORK 8-8

1. 1

2a. min = .5 ft.

max = 4 ft.

2b. 2 seconds

3. C

4. Per. = 2.5 sec;

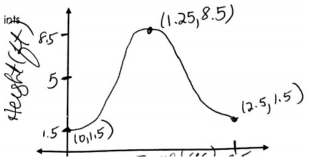
No the max. reached is 26"

5a. 1.5 feet

5b. 8.5 feet

5c. 2.5 seconds

5d.



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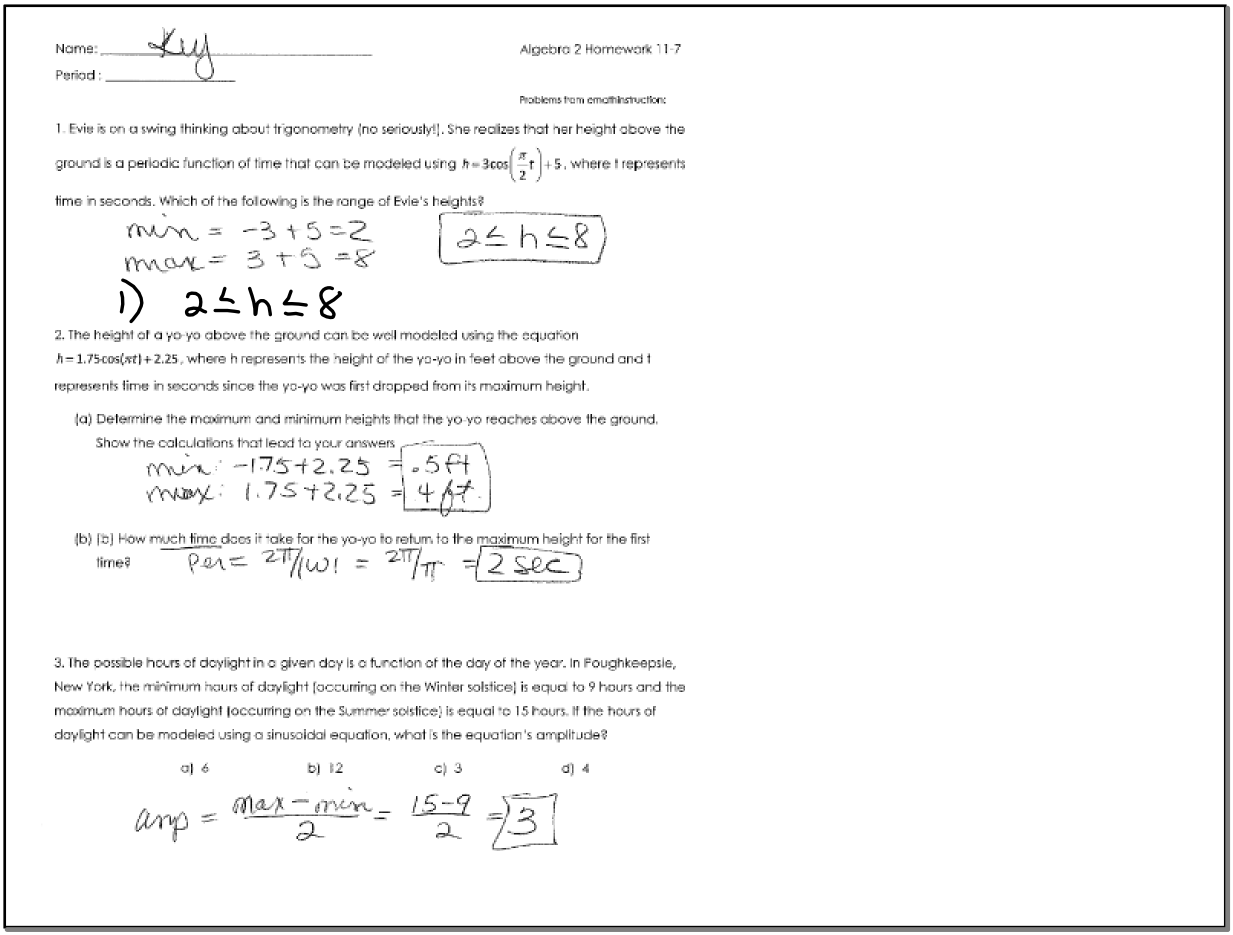

Name: Key

Period :

Algebra 2 Homework 11-7

Problems from emathinstruction:

1. Evie is on a swing thinking about trigonometry (no seriously!). She realizes that her height above the ground is a periodic function of time that can be modeled using $h=3\cos\left(\frac{\pi}{2}t\right)+5$, where t represents time in seconds. Which of the following is the range of Evie's heights?

min = -3 + 5 = 2
max = 3 + 5 = 8

$\boxed{2 \le h \le 8}$

1) $2 \le h \le 8$

2. The height of a yo-yo above the ground can be well modeled using the equation $h=1.75\cos(\pi t)+2.25$, where h represents the height of the yo-yo in feet above the ground and t represents time in seconds since the yo-yo was first dropped from its maximum height.

(a) Determine the maximum and minimum heights that the yo-yo reaches above the ground. Show the calculations that lead to your answers

min: -1.75 + 2.25 = $\boxed{.5 \text{ ft}}$
max: 1.75 + 2.25 = $\boxed{4 \text{ ft.}}$

(b) (b) How much time does it take for the yo-yo to return to the maximum height for the first time?

Per = $2\pi/|\omega|$ = $2\pi/\pi$ = $\boxed{2 \text{ sec}}$

3. The possible hours of daylight in a given day is a function of the day of the year. In Poughkeepsie, New York, the minimum hours of daylight (occurring on the Winter solstice) is equal to 9 hours and the maximum hours of daylight (occurring on the Summer solstice) is equal to 15 hours. If the hours of daylight can be modeled using a sinusoidal equation, what is the equation's amplitude?

a) 6
b) 12
c) 3
d) 4

amp = $\frac{\text{max} - \text{min}}{2} = \frac{15-9}{2} = \boxed{3}$

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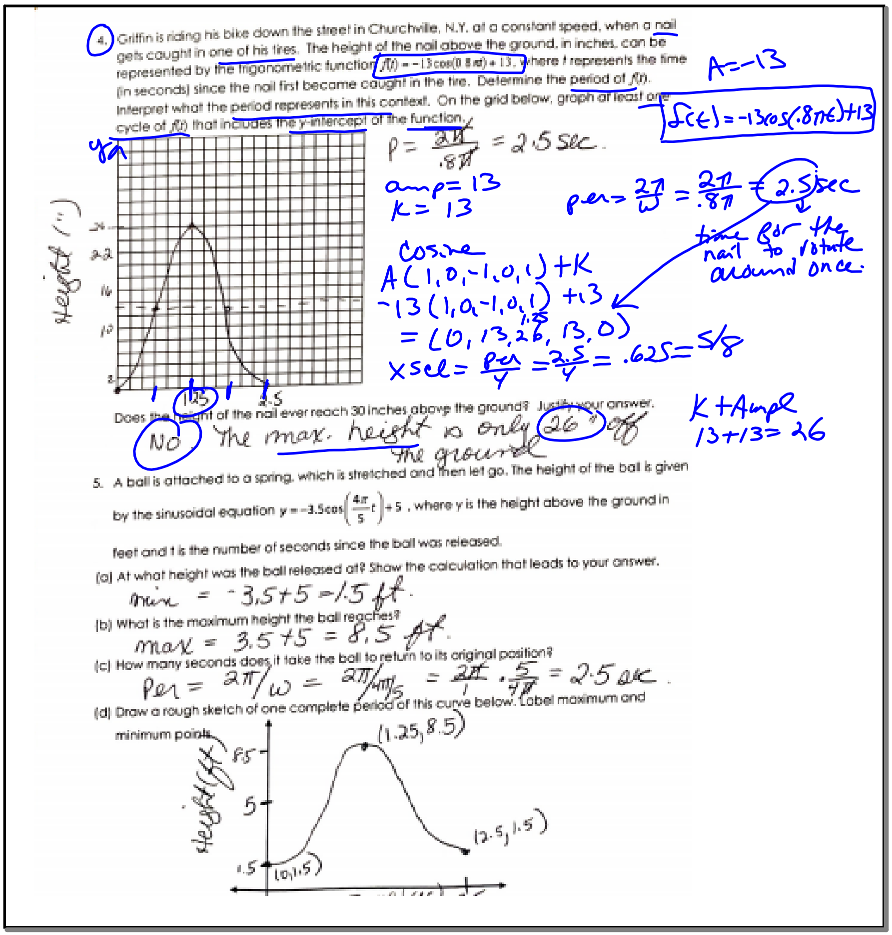

④ Griffin is riding his bike down the street in Churchville, N.Y. at a constant speed, when a nail gets caught in one of his tires. The height of the nail above the ground, in inches, can be represented by the trigonometric function $\boxed{f(t) = -13\cos(0.8\pi t) + 13}$, where t represents the time (in seconds) since the nail first became caught in the tire. Determine the period of $f(t)$. Interpret what the period represents in this context. On the grid below, graph at least one cycle of $f(t)$ that includes the y-intercept of the function.

A=-13

$\boxed{f(t) = -13\cos(.8\pi t)+13}$

$p = \frac{2\pi}{.8\pi} = 2.5$ sec.

amp = 13

K = 13

per = $\frac{2\pi}{\omega} = \frac{2\pi}{.8\pi} = 2.5$ sec

time for the nail to rotate around once.

Cosine

A(1,0,-1,0,1)+K

-13(1,0,-1,0,1) +13

= (0, 13, 26, 13, 0)

xscl = $\frac{per}{4} = \frac{2.5}{4} = .625 = 5/8$

Does the height of the nail ever reach 30 inches above the ground? Justify your answer.

NO. The max. height is only 26" off the ground

K + Ampl

13+13 = 26

5. A ball is attached to a spring, which is stretched and then let go. The height of the ball is given by the sinusoidal equation $y = -3.5\cos\left(\frac{4\pi}{5}t\right) + 5$, where y is the height above the ground in feet and t is the number of seconds since the ball was released.

(a) At what height was the ball released at? Show the calculation that leads to your answer.

min = -3.5+5 = 1.5 ft.

(b) What is the maximum height the ball reaches?

max = 3.5+5 = 8.5 ft.

(c) How many seconds does it take the ball to return to its original position?

$Per = 2\pi/\omega = 2\pi/\frac{4\pi}{5} = \frac{2\pi}{1} \cdot \frac{5}{4\pi} = 2.5$ sec.

(d) Draw a rough sketch of one complete period of this curve below. Label maximum and minimum points.

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Day 9: Application #2

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Each day the tide continuously goes in and out, raising and lowering a boat (sinusoidally) in the harbor. At low tide, the boat is only 2 feet above the ocean floor. And, 6 hours later, at peak high tide, the boat is 40 feet above the ocean floor. Write a cosine ~~sine~~ function that describes the boat's *distance above the ocean floor as it relates to time.*

→x ↳y

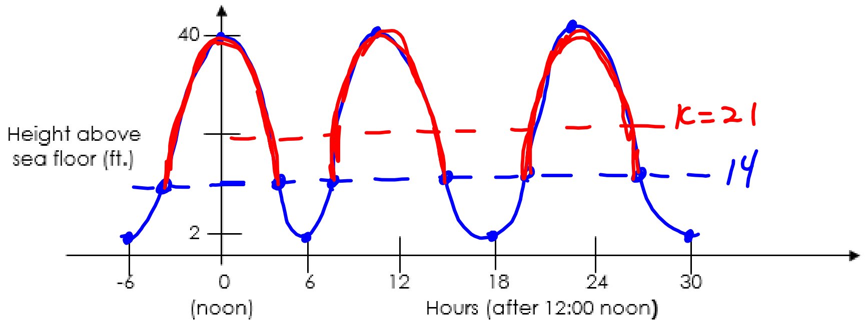
(H) For safety, the boat needs 14 feet of depth to sail. If high tide occurs at noon, between what times can the boat go out to sea?

(F) Write an equation that models the boat's height above the ocean floor.

x	-6	0	6	12	18	24	30
y	2	40	2	40	2	40	2

$f(x) = A\,\overset{\cos}{\cancel{\sin}}\,(\omega\,(x-h) + k$

A. Sketch the graph below.



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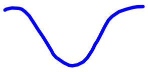
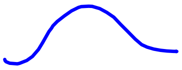
B. Find the vertical shift. k= avg = midline = $\frac{40+2}{2} = \boxed{21 = k}$

C. Find the amplitude. Amplitude = $\boxed{(19) = A}$ max − middle

40 − 21 = 19


y = cos x y = −cos x


D. Find the period and frequency.

Period = 12 (hours)

Freq = $\frac{1}{12}$ (1 cycle in 12 hours)

w: $Per = \frac{2\pi}{w} = \frac{12}{1}$

$12w = 2\pi$

$\boxed{w = \frac{2\pi}{12} = \frac{\pi}{6}}$

E. Find the horizontal shift. —none

h=0

F. Write the equation. $f(x) = A\cos(w(x-h) + k)$

$f(x) = 19\cos(\frac{\pi}{6}x) + 21$

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G. Use this sketch to check points to confirm your model (Use: x = -6, x = 0, x = 9 in your model and compare the results to your sketch)

$f(-6)$

$f(0)$

$f(9)$

H. When can the boat safely go out to sea?

We discussed using the calculator intersect function to find intersections between our funtion in y_1 and y_2 = 14. Convert the x values to times before or after noon to determine the best time intervals for the boat to go out to sea.

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Nov 11-4:42 PM