Date: ____________________

Today's Learning Goal(s):

By the end of the class, I will be able to:

a) sketch sinusoidal functions using transformations.

Last day's work: pp. 383-385 #1 – 4 [12]

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2. If the function $f(x) = 4\cos 3x + 6$ starts at $x = 0$ and completes two full cycles, determine the period, amplitude, equation of the axis, domain, and range.

$\to = \frac{360^\circ}{3}$

$= 120^\circ$

$\to = 4$

$\to y = 6$

D: $\{x \in \mathbb{R}\}$

$\{y \in \mathbb{R} \mid 2 \le y \le 10\}$

$\ast$ D: $\{x \in \mathbb{R} \mid 0^\circ \le x \le 240^\circ\}$

6.5 Using Transformations to Sketch Sinusoidal Functions Day2

Date: Dec. 5/19

Ex. 1 Sketch (one cycle) for:

$y = -3\cos(2x - 90^\circ) - 1$

$= -3\cos(2(x-45^\circ))-1$

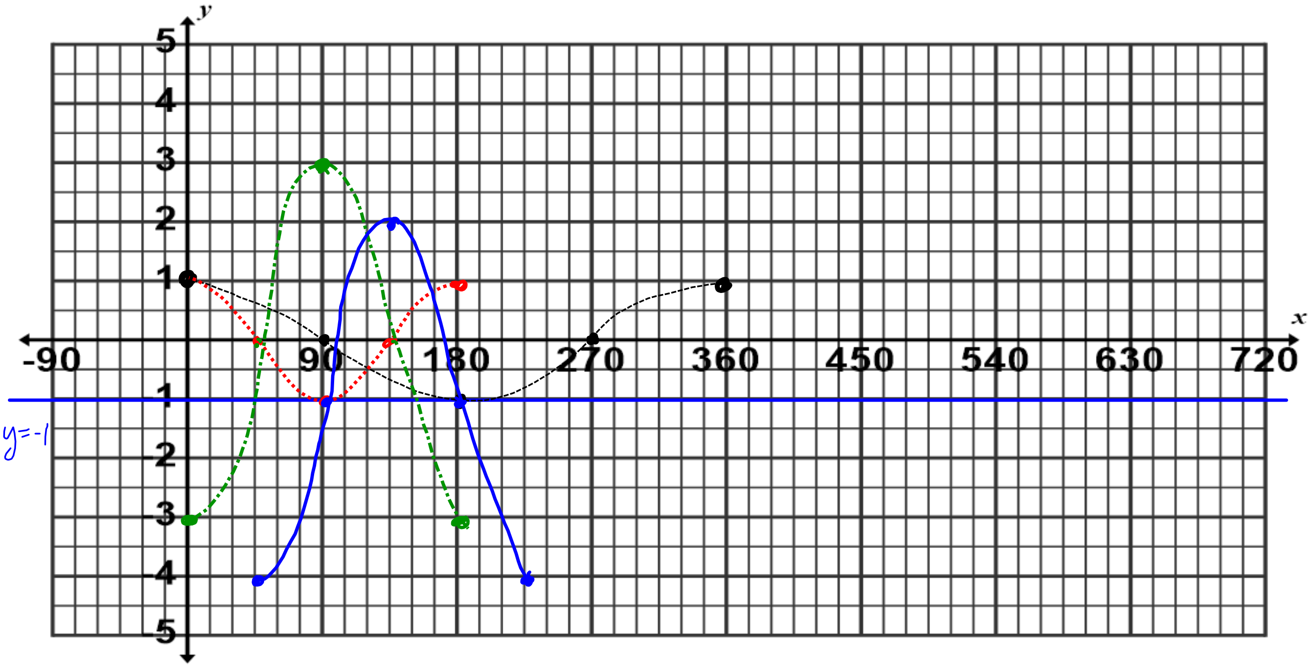
amplitude: 3

period: $\frac{360^\circ}{2}$ $= 180^\circ$

phase shift: 45° to the right

equation of the axis: $y=-1$
(vertical shift)

range: $\{y \in \mathbb{R} \mid -4 \le y \le 2\}$



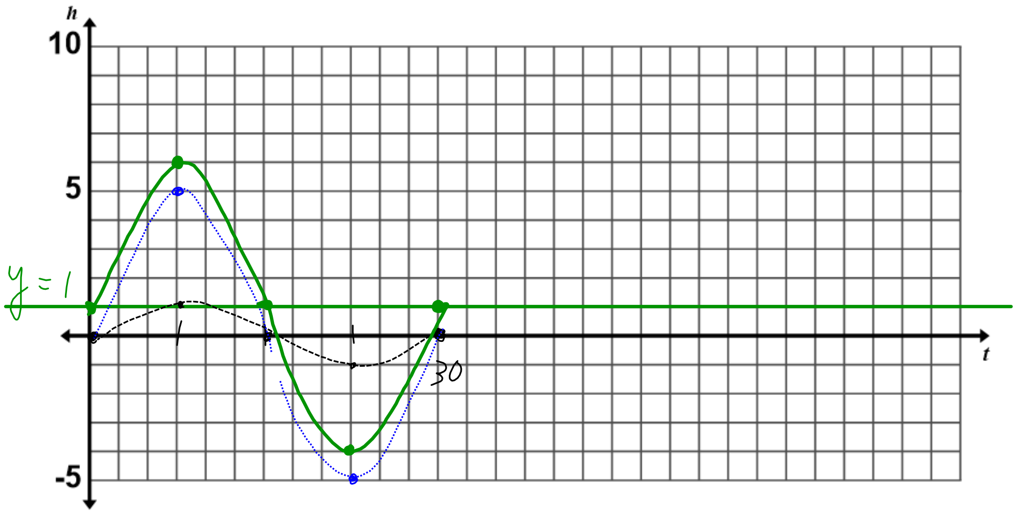
Ex. 2

A water wheel turns. The height of a nail at the circumference of the wheel is given by $h = 5\sin(\underline{12t})^{\circ} + 1$. Graph the function.

$$\text{period} = \frac{360^{\circ}}{12} = 30^{\circ}$$

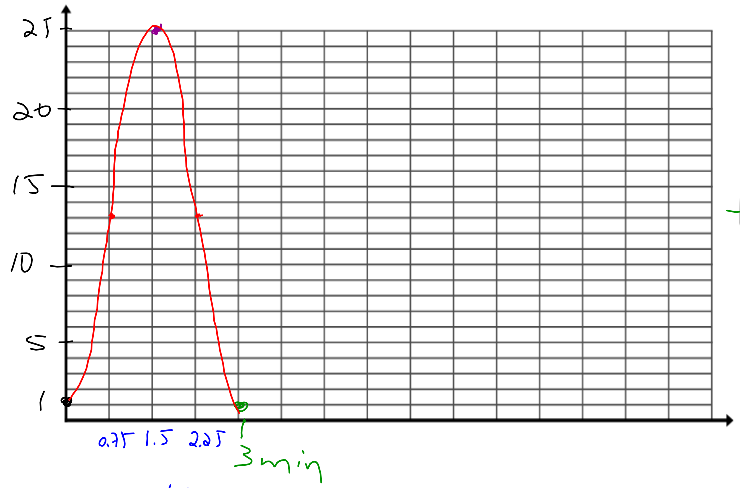
$a = 5$

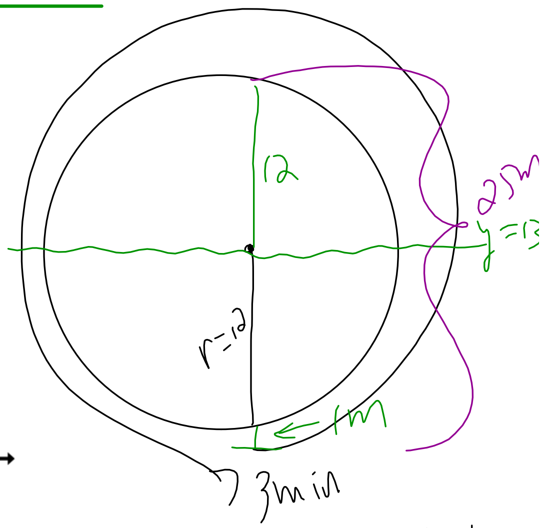
Eq'n of the axis : $y = 1$



(if time) ***(see next screen for a thorough solution, with multiple answers)***

Ex. 3 Ron gets on a ferris wheel.
The radius of the wheel is 12 m and he starts 1 m off the ground.
The wheel takes 3 minutes to go around.
Determine "an" equation for Ron's height in terms of the time.





$h(t) = a\cos(k(t-d)^\circ) + c$

$= 12\cos 120(t-0)) + 13$

$= -12\cos(120t) + 13$

period = 3 min

$k = \frac{360^\circ}{3}$

$= 120$

(if time)

Ex. 3 Ron gets on a ferris wheel.
The radius of the wheel is 12 m and he starts 1 m off the ground.
The wheel takes 3 minutes to go around.
Determine an equation for Ron's height in terms of the time.

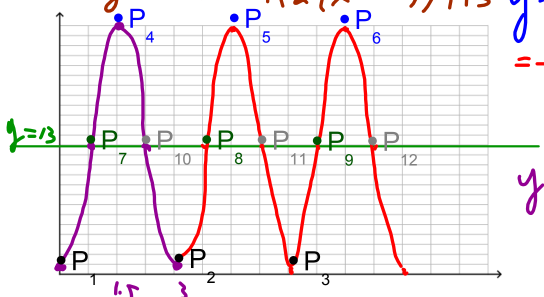
Also $y = 12\sin(2(x \quad))+13$

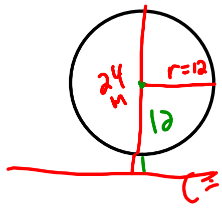
$y = a\cos(k(x-d))+c$

$= -12\cos(2(x-0))+13$

or -180

$y = 12\cos(2(x-90))+13$





$C = 2\pi r$
$= 24\pi$

1.5 90 sec

3 180

3 min = 180 sec.

min. value = 1 m

max. value = 25 m

amplitude = 12

$\text{period} = \frac{360}{k}$

$k = \frac{360}{\text{period}}$

$= \frac{360}{180 \leftarrow \text{sec}}$

$= 2$

$k = \frac{360}{3} \leftarrow \text{min}$

$= 120$

Conclusions:

The final equation depends on two main criteria:
- the point we chose as our "starting point"
- whether we choose a sine vs. cosine function

Note: the units we use may also change the result, as I will show:
was suggested in class to change the time to seconds, therefore,
period was 120 seconds, resulting in $k = 2$, and the scale is 45 sec.
d we left the time in minutes, then $k = 120$, and the scale is 0.75 min.

Choosing points P_1-P_3, uses a cosine curve with a = - 12.

(P_1) $y = -12\cos(2(x-0))+13$

(P_2) $y = -12\cos(2(x-180))+13$

(P_3) $y = -12\cos(2(x-360))+13$

Choosing points P_4-P_6, uses a cosine curve with a = + 12.

(P_4) $y = 12\cos(2(x-90))+13$

(P_5) $y = 12\cos(2(x-270))+13$

(P_6) $y = 12\cos(2(x-450))+13$

Choosing points P_7-P_9, uses a sine curve with a = + 12.

(P_7) $y = 12\sin(2(x-45))+13$

(P_8) $y = 12\sin(2(x-225))+13$

(P_9) $y = 12\sin(2(x-405))+13$

Choosing points P_{10}-P_{12}, uses a sine curve with a = - 12.

(P_{10}) $y = -12\sin(2(x-135))+13$

(P_{11}) $y = -12\sin(2(x-315))+13$

(P_{12}) $y = -12\sin(2(x-495))+13$

Are there any Homework Questions you would like to see on the board?

Last day's work: pp. 383-385 #1 – 4 [12]

Today's Homework Practice includes: pp. 383-385 #5 – 9 [13]