Name: Key

Unit 7 Review – Trig Graphs

Helpful Information:

$$y = A\sin\big(F(x+H)\big) + V$$

- sin can be replaced with cos
- A = amplitude (distance from midline to max)
- F = frequency (# cycles in a 2π interval)
- H = horizontal shift (shifts opposite)
- V = vertical shift (midline)

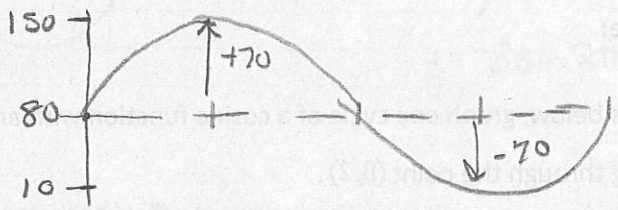
- Sine crosses through the midline on the y-axis
- Cosine starts at a maximum (or minimum if it's negative)

Level I Practice:

1. The Ferris wheel at the landmark Navy Pier in Chicago takes 7 minutes to make one full rotation. The height, H, in feet, above the ground of one of the six-person cars can be modeled by $H(t) = 70\sin\left(\frac{2\pi}{7}(t-1.75)\right) + 80$, where t is time, in minutes. Using $H(t)$ for one full rotation, this car's minimum height, in feet, is

amp. midline

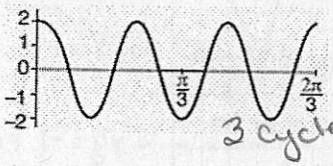
1) 150
2) 70
3) 10
4) 0



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

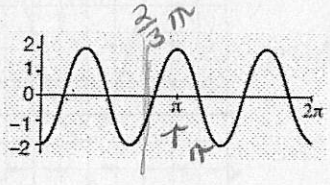
amp = 2
Period $\frac{2}{3}\pi$ = length of 1 full cycle.

1)

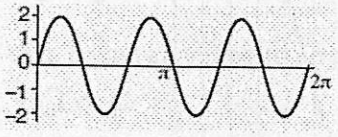


3 cycles.

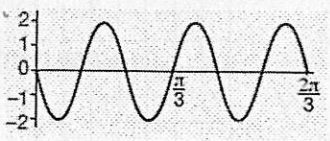
3)



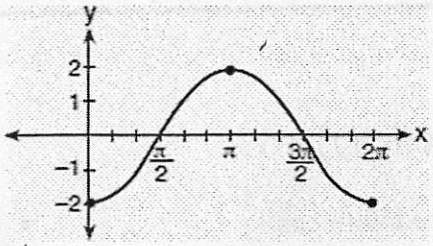
2)



4)



3. The accompanying graph shows a trigonometric function. State an equation of this function.



- Cos curve
- amp = 2
- Period = 2π
- frequency = $\frac{2\pi}{\text{Period}}$
- $\frac{2\pi}{2\pi} = 1$

$y = -2\cos x$

4. Which statement is *incorrect* for the graph of the function $y = -3\cos\left[\frac{\pi}{3}(x-4)\right] + 7$?

1) The period is 6.

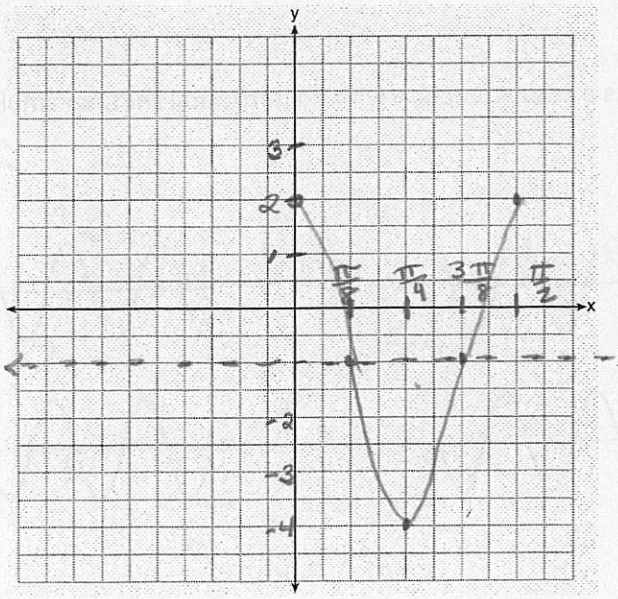
2) The amplitude is 3.

3) The range is [4,10]. → y-value

(4) The midline is $y = -4$.

Level II Practice:

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



Intervals = $\frac{\text{Per}}{4}$

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

→ $y = -1$ (mid line.

6. Relative to the graph of $y = 3\sin x$, what is the shift of the graph of $y = 3\sin\left(x + \frac{\pi}{3}\right)$?

horizontal shift
Shifts opposite

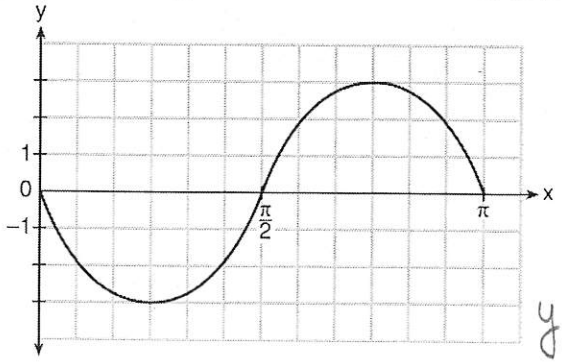
1) $\frac{\pi}{3}$ right

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

3) $\frac{\pi}{3}$ up

4) $\frac{\pi}{3}$ down

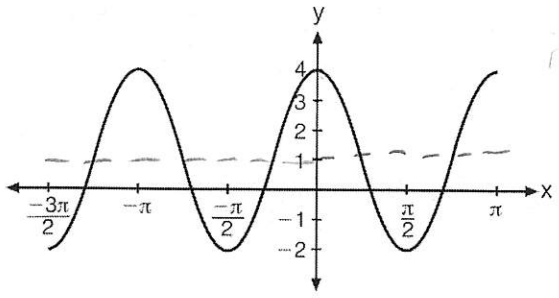
7. Write an equation for the graph of the trigonometric function shown below.



- Sin curve
amp = 3
Freq = 2
$y = -3\sin 2\pi$

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

8. The periodic graph below can be represented by the trigonometric equation $y = a\cos bx + c$ where *a*, *b*, and *c* are real numbers.



$amp = \frac{4 - -2}{2} = \frac{6}{2} = 3$

midline = max − amp
4 − 3 = 1

State the values of *a*, *b*, and *c*, and write an equation for the graph.

$a = amp = \frac{4 - -2}{2} = \frac{6}{2} = 3$

c = midline (vertical shift) = max − amp = 4 − 3 = +1

b = frequency
$Per = \frac{2\pi}{F}$
$\pi = \frac{2\pi}{F}$

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

2 cycles of the graph occur in 2π

equation:
$y = 3\cos 2x + 1$

Level III Practice:

9. 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 time in seconds?

1) $V = 120\sin(t)$

2) $V = 120\sin(60t)$

3) $V = 120\sin(60\pi t)$

4) $V = 120\sin(120\pi t)$

Period = $\frac{1}{60}$ second.

Period = $\frac{2\pi}{\text{Freq}}$

$\frac{1}{60} = \frac{2\pi}{\text{Freq}}$

Freq = $60(2\pi) = 120\pi$

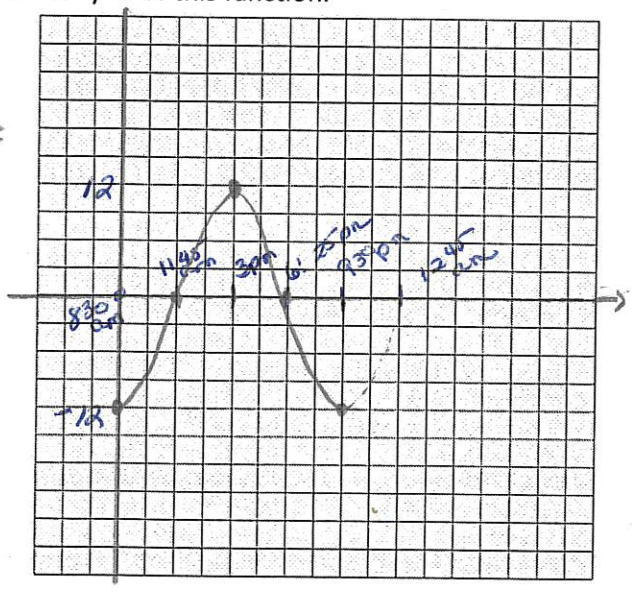
10. The ocean tides near Carter Beach follow a repeating pattern over time, with the amount of time between each low and high tide remaining relatively constant. On a certain day, low tide occurred at 8:30 a.m. and high tide occurred at 3:00 p.m. At high tide, the water level was 12 inches above the average local sea level; at low tide it was 12 inches below the average local sea level. Assume that high tide and low tide are the maximum and minimum water levels each day, respectively. Write a cosine function of the form $f(t) = A\cos(Bt)$, where A and B are real numbers, that models the water level, $f(t)$, in inches above or below the average Carter Beach sea level, as a function of the time measured in t hours since 8:30 a.m.

On the grid below, graph one cycle of this function.

Starts at low tide

Amp = 12

$f(t) = -12\cos\frac{2\pi}{13}t$



Period = 13 hours

Freq = $\frac{2\pi}{13}$ $\left(\frac{2\pi}{\text{Per}}\right)$

from 8^{30} – 3pm → $6\frac{1}{2}$ hrs.

3pm + $6\frac{1}{2}$ = 9^{30} pm

1 cycle goes from 8^{30} am – 9^{30} pm (13 hrs)

People who fish in Carter Beach know that a certain species of fish is most plentiful when the water level is increasing. Explain whether you would recommend fishing for this species at 7:30 p.m. or 10:30 p.m. using evidence from the given context. Not @ 7^{30} pm tide still decreasing

But at 10^{30} pm tide is increasing so they should fish then.