| Day 13 Warm Up |
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1. Identify the amplitude, period, and midline of the following trig function.
   Hint: it may help to trace out one cycle.

$amp = \dfrac{|max - min|}{2}$

$= \dfrac{|1.5 - 1.5|}{2}$

$\boxed{amp = 1.5}$

$per = end - start$

$360 - 0$

$\boxed{per = 360}$

$midline = mm + amp = -1.5 + 1.5$
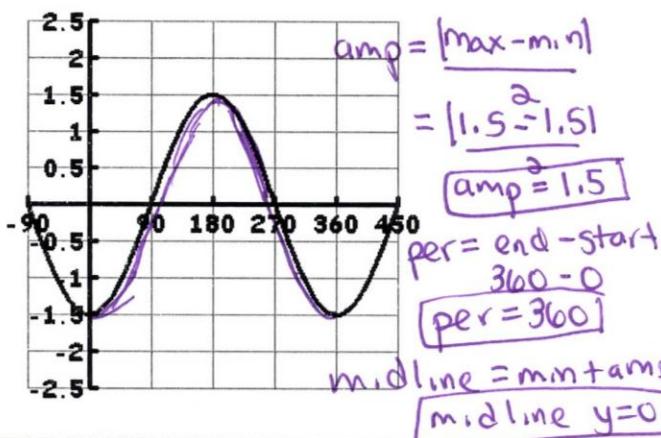
$\boxed{midline\ y = 0}$

State the amplitude, period, and midline of each of the following:

2. $y = (1/2)\sin(x)$

$y = a \sin(bx)$

$amp = |1/2|$ $\boxed{amp = 1/2}$ $per = \dfrac{360}{b} = \dfrac{360}{1}$ $\boxed{per = 360}$ midline $= d$ $\boxed{y = 0}$

3. $y = -5\cos(3x)$

$amp = |-5|$ $\boxed{amp = 5}$ $per = \dfrac{360}{b} = \dfrac{360}{3}$ $\boxed{per = 120}$ midline $= d$ $\boxed{y = 0}$

4. $y = \sin(x + 5) - 6$

$amp = |1|$ $\boxed{amp = 1}$ $per = \dfrac{360}{b} = \dfrac{360}{1}$ $\boxed{per = 360}$ midline $= d$ $\boxed{y = -6}$

5. $y = 2\cos(x) + 3$

$amp = |2|$ $\boxed{amp = 2}$ $per = \dfrac{360}{b} = \dfrac{360}{1}$ $\boxed{per = 360}$ midline $= d$ $\boxed{y = 3}$

Day 13 Notes: Graphing Practice, Writing Equations of Trig Functions

Graphing Practice: Graph the following functions over two periods, one in the positive direction and one in the negative directions. Label the axes appropriately.

1. $y = -2\sin(3x)$ Amplitude: ___2___   Midline: $y = 0$ Period: $120°$

   $|-2|$ $360/3$

2. $y = \cos(2x) - 1$ Amplitude: ___1___   Midline: $y = -1$ Period: $180°$

   $360/2$
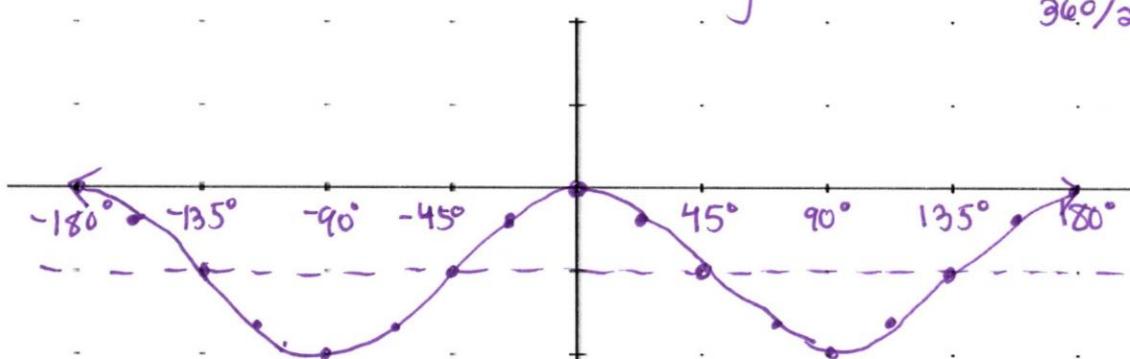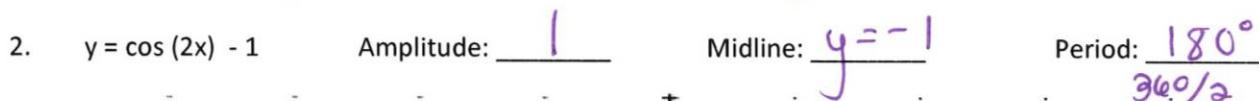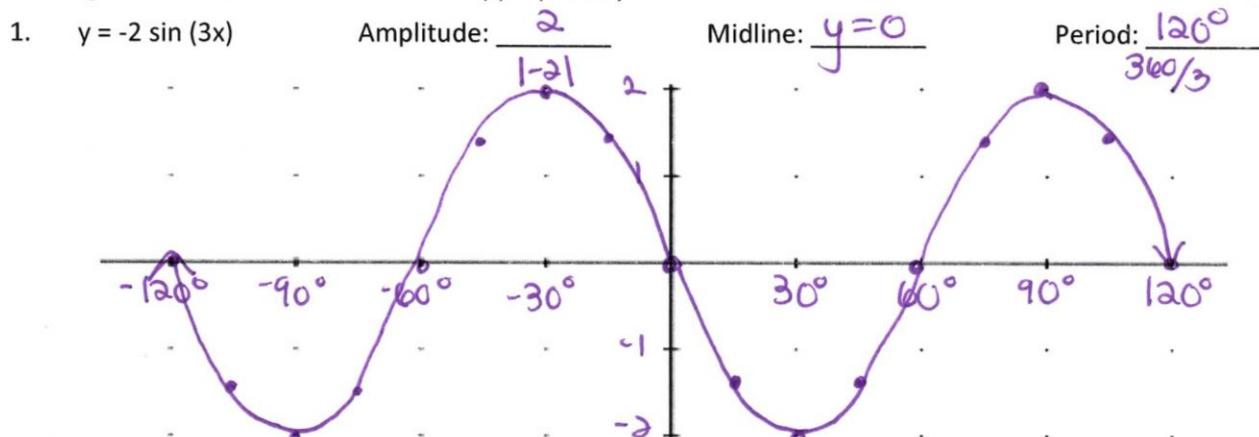
3. $y = 3 \sin(1/2 x)$ Amplitude: __3__   Midline: __y=0__   Period: __720°__
$360/(^1/_2)$
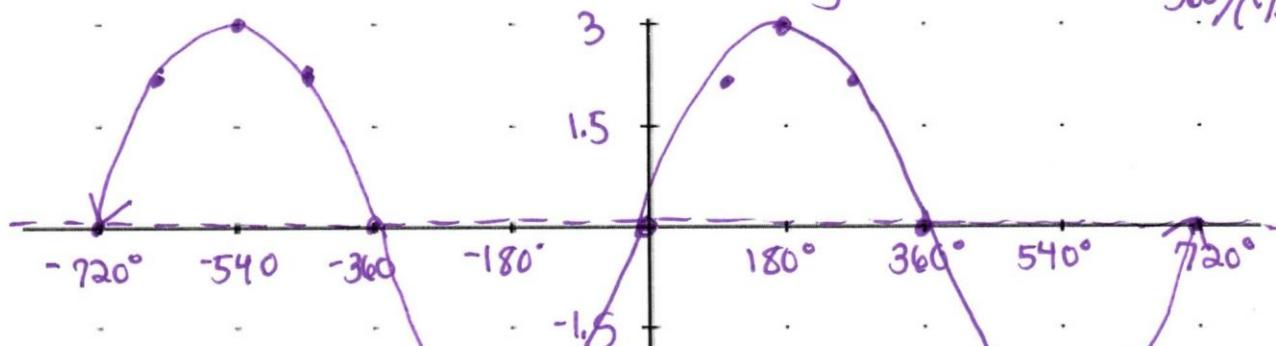
4. $y = -2 \cos(4x) + 1$ Amplitude: __2__   Midline: __y=1__   Period: __90__
$|-2|$ $360/4$
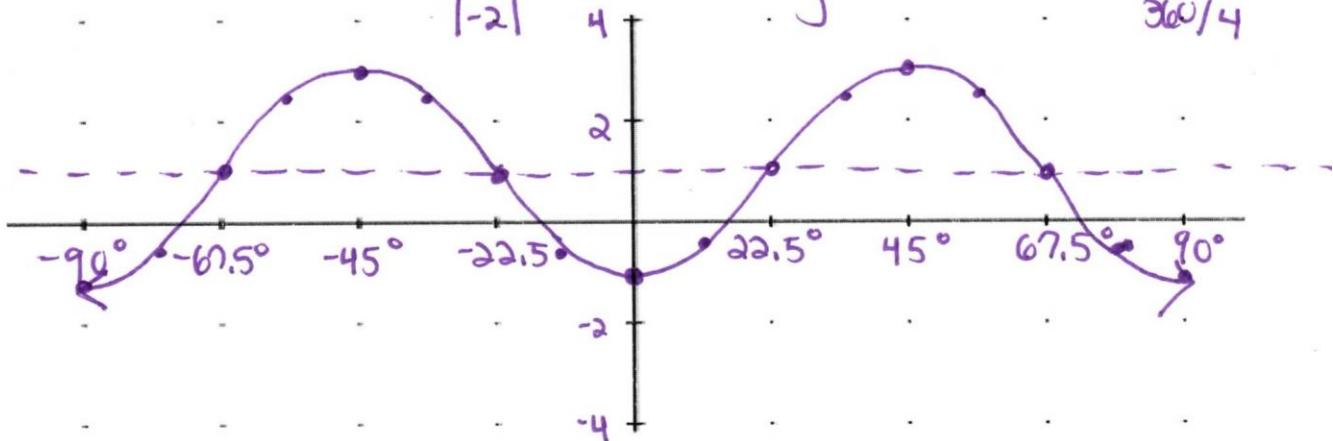
Notes: Writing an equation given a trig graph

To write an equation of a trigonometric function when given a graph, first determine

___amplitude___ , ___midline___ , and ___period___ of the graph.

**HINT: tracing one cycle of the graph can help determine these values AND decide if sine or cosine is better.

Then use those values and the formulas to calculate a, b, and d of the standard equation $y = a \sin(bx) + d$ or
$y = a \cos(bx) + d$.

Formulas we must know

$$\text{Amplitude} = \frac{|max - min|}{2} = |a|$$

$$\text{Period} = \frac{360°}{b}$$
$= end - start$

$$\text{Midline} = \frac{max + min}{2} = d$$
$OR \quad min + amp = d$

Write the equation for the following trigonometric functions.

1) A radio transmitter sends a radio wave from the top of a 50-foot tower. The wave is represented by the accompanying graph.
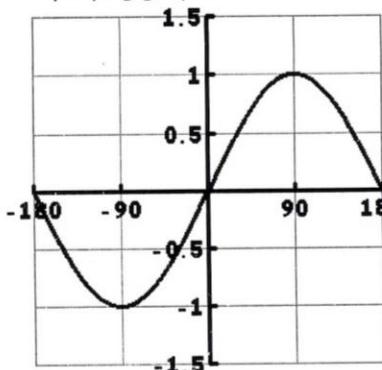
$*amp = 1 = a$

$*period \rightarrow draw\ rest\ of\ 1\ cycle = 360 - 0 = 360° = per$
$\quad end\ start$

$per = \dfrac{360}{b} \qquad 360 = \dfrac{360}{b}$

$b = 1$

$*midline\ \boxed{y=0}\ \boxed{d=0}$

$*hill\ then\ valley \rightarrow do\ sine$

$y = 1 \sin(1x) + 0 \qquad \boxed{y = \sin(x)}$

2) The accompanying graph represents a portion of a sound wave.

$*amp = \left|\dfrac{max-min}{2}\right| = \dfrac{3-1}{2} = \dfrac{2}{2} = 1 = amp \quad \boxed{a=1}$

$*per = \dfrac{180 - 0}{end\ start} = \boxed{180 = per}$

$180 = \dfrac{360}{b}$

$180b = 360 \quad \boxed{b=2}$

$*midline = min + amp$

$\boxed{y = 2\ midline} \quad \boxed{d=2}$

$\boxed{y = \sin(2x) + 2}$

3)

$*Sine\ b/c\ hill\ then\ valley$

$max - min$

$*amp = |5 - -5| = \dfrac{10}{2} = 5 \quad \boxed{amp\ =5}$

$\boxed{a=5}$

$*per = \dfrac{8 - 0}{end\ start} = \boxed{8\ per}$

$8 = \dfrac{360}{b} \qquad 8b = 360$

$\dfrac{8b}{8} = \dfrac{360}{8} \quad \boxed{b=45°}$

$*midline = \dfrac{max + min}{2} = \dfrac{5 + -5}{2} = 0 \quad \boxed{y=0}$

$\boxed{d=0}\ midline$

$\boxed{y = 5\cos(45x)} \quad *cos\ b/c\ big\ valley$
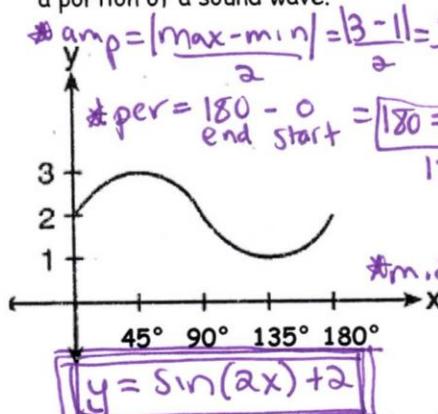
You Try!   Write the equation for the following trigonometric functions.

4)

$*amp = \left|\dfrac{2 - -2}{2}\right| = \dfrac{4}{2} = 2 = amp \quad \boxed{a = -2}$

$*per = \dfrac{360 - 0}{end\ start} \quad \boxed{per =360°}$

$360 = \dfrac{360}{b} \quad \boxed{b=1}$

$*midline = \dfrac{-2 + 2}{min\ amp} = \boxed{y = 0\ midline}$

$\boxed{d=0}$

$\boxed{y = -2\cos(x)} \quad *cos\ b/c\ big\ hill$

5)

$*amp = \dfrac{|max - min|}{2} = \dfrac{|2 - -2|}{2} = \dfrac{4}{2} = 2 = amp \quad \boxed{a = -2}$

$*per = \dfrac{4 - 0}{end - start} \quad \boxed{per = 4}$

$4 = \dfrac{360}{b} \qquad 4b = 360$

$\boxed{b = 90}$

$*midline = \dfrac{max + min}{2} + \dfrac{-2}{2} = 0 \quad \boxed{y=0} \quad \boxed{d=0}$

$\boxed{y = -2\sin(90x)} \quad *Sine\ b/c\ valley\ then\ hill$

6)

Depth of Water

# of Hours after Midnight
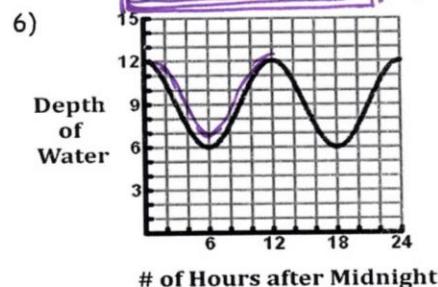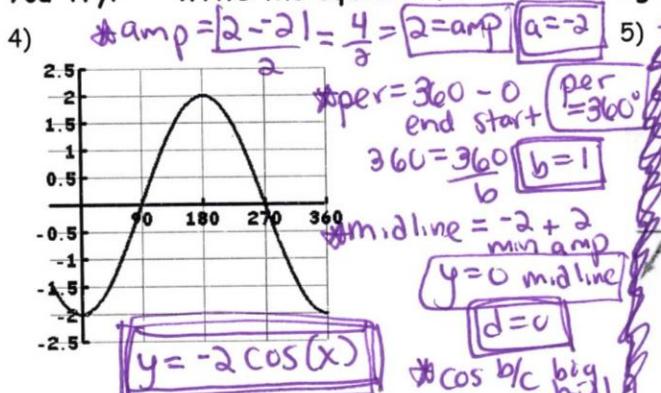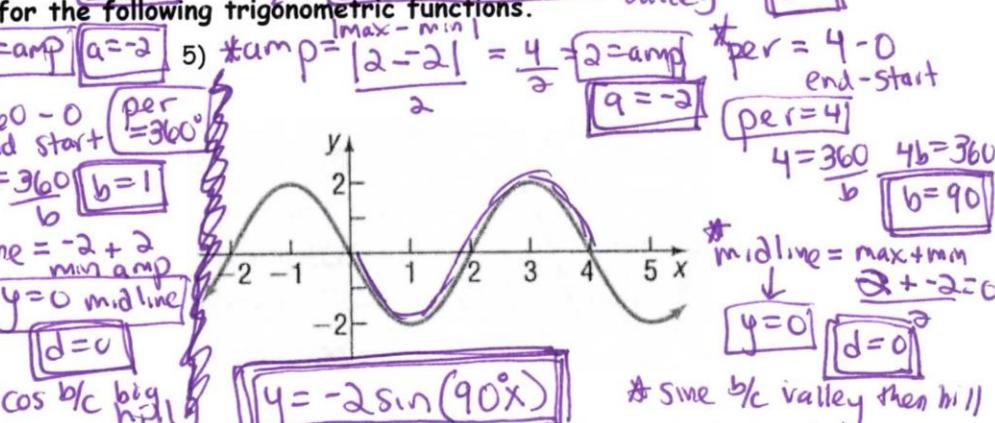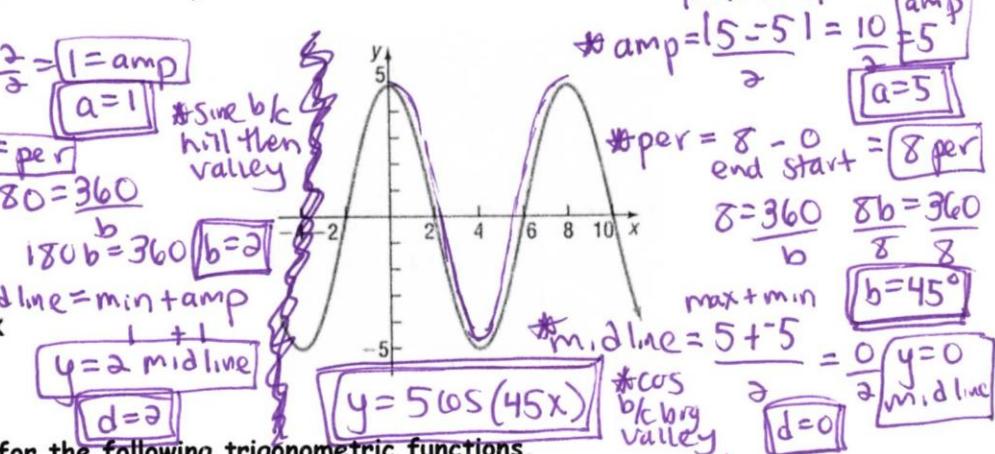
The figure at the left shows that the depth of water at a boat dock varies with the tides. The depth is 6 feet at low tide and 12 feet at high tide. On a certain day, low tide occurs at 6 AM and high tide occurs at 12 Noon.

$*amp = \dfrac{|max - min|}{2} = \dfrac{|12 - 6|}{2} = \dfrac{6}{2} = 3 = amp \quad \boxed{a=3}$

$*per = \dfrac{12 - 0}{end\ start} = \boxed{12 = per}$

$12 = \dfrac{360}{b} \qquad 12b = 360$

$\dfrac{12b}{12} = \dfrac{360}{12} \quad \boxed{b=30}$

$*midline = min + amp = 6 + 3 \quad \boxed{y = 9}\ midline$

$\boxed{d = 9} \quad *cos\ b/c\ big\ valley$

$\boxed{Y = 3\cos(30x) + 9}$