

Name:

Period:

Date:

Extra Practice: Graphing with Transformations

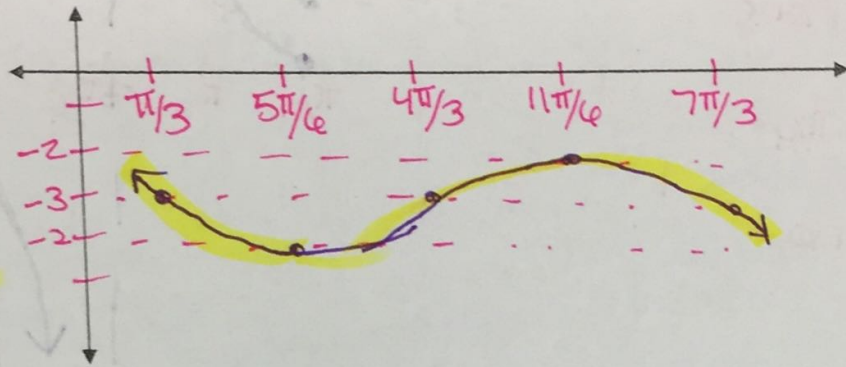
1. $y = -\sin\left(x - \frac{\pi}{3}\right) - 3$

Amplitude: 1

Period: 2π Phase Shift: $\frac{\pi}{3}$

Vertical Displacement: -3

Reflection? yes



beg: $x - \frac{\pi}{3} = 0$
 $x = \frac{\pi}{3}$

end: $x - \frac{\pi}{3} = 2\pi$
 $x = \frac{7\pi}{3}$

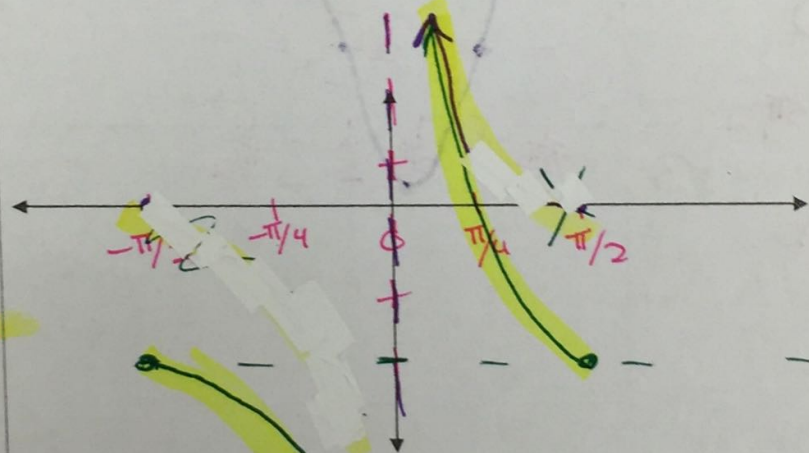
2. $y = -\tan\left(x + \frac{\pi}{2}\right) - 2$

Amplitude: none

Period: π Phase Shift: $-\frac{\pi}{2}$

Vertical Displacement: -2

Reflection? yes



beg: $x + \frac{\pi}{2} = 0$
 $x = -\frac{\pi}{2}$

end: $x + \frac{\pi}{2} = \pi$
 $x = \frac{3\pi}{2}$

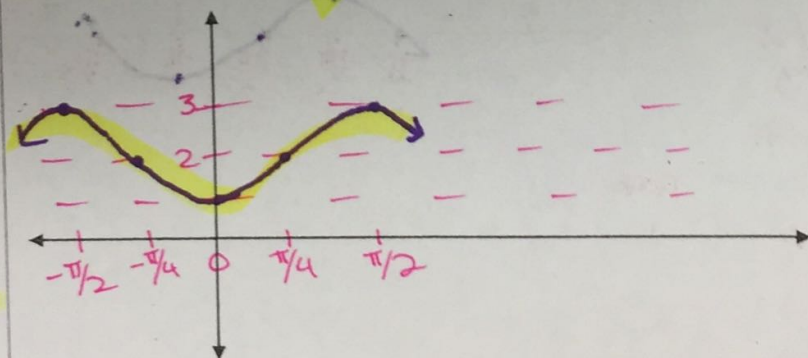
3. $y = 2 + \cos(2x + \pi)$

Amplitude: 1

Period: π Phase Shift: $-\frac{\pi}{2}$

Vertical Displacement: 2

Reflection? no



beg: $2x + \pi = 0$
 $x = -\frac{\pi}{2}$

$2x + \pi = 2\pi$
 $x = \frac{\pi}{2}$

4. $y = 1 + \tan\left(x - \frac{\pi}{4}\right)$

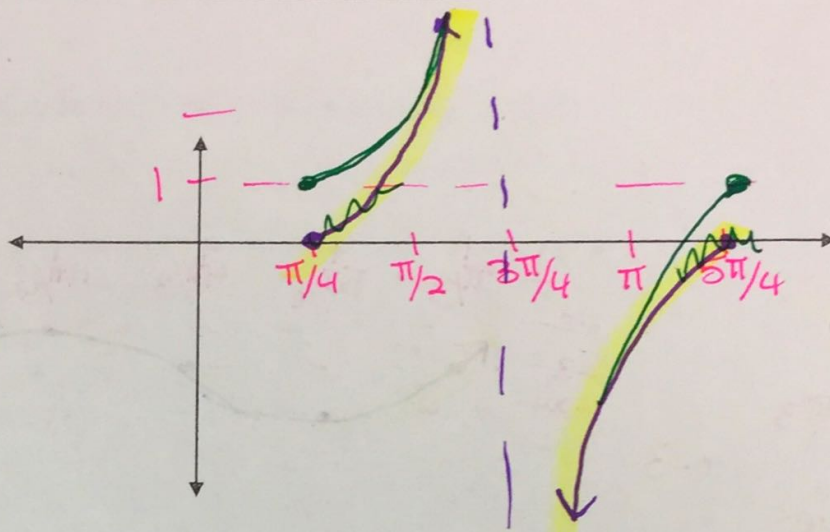
Amplitude: none

Period: π

Phase Shift: $\pi/4$

Vertical Displacement: 1

Reflection? no



5. $y = 3 + 2 \cos\left(x + \frac{3\pi}{2}\right)$

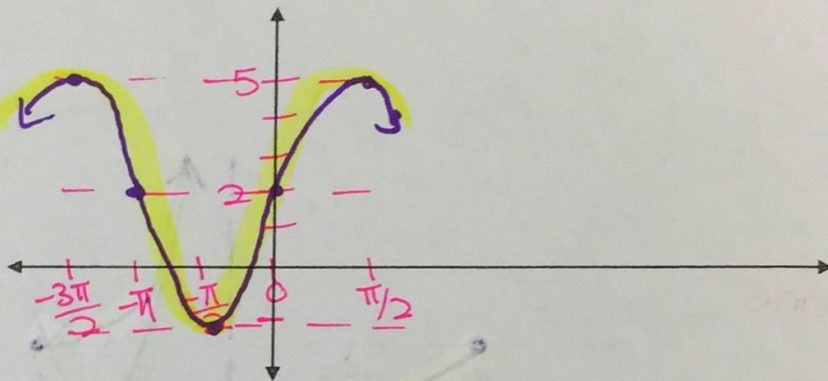
Amplitude: 2

Period: 2π

Phase Shift: $-3\pi/2$

Vertical Displacement: 3

Reflection? no



$x + \frac{3\pi}{2} = 0$

$x = -\frac{3\pi}{2}$

$x + \frac{3\pi}{2} = 2\pi$

$x = \frac{\pi}{2}$

6. $y = \frac{1}{2} \sin(3x + 3\pi)$
 $3(x + \pi)$

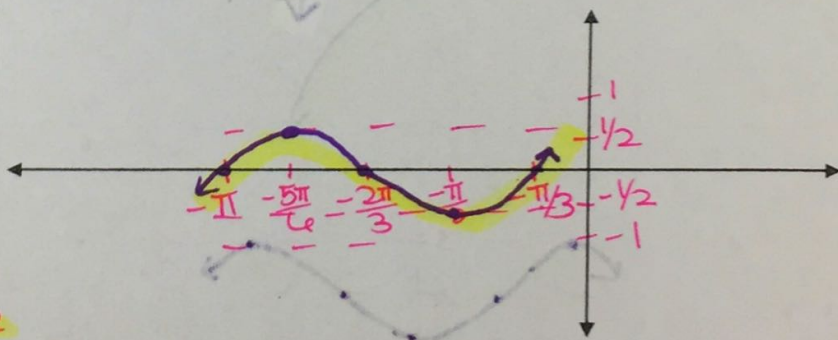
Amplitude: $1/2$

Period: $2\pi/3$

Phase Shift: $-\pi$

Vertical Displacement: none

Reflection? no



$3x + 3\pi = 0$

$x = -\pi$

$3x + 3\pi = 2\pi$

$x = -\pi/3$

Describe the transformations occurring in each function, and state the amplitude and period.

7. $y = -2 \tan(3x)$

no amp.
per = π/b
no phase shift
no vertical shift

11. $y = 2 \csc(x - \pi)$

no amp
per = 2π
PS = π
US = none

8. $y = -4 \sec x$

Amp = none
Per = 2π
PS = none
US = none

12. $y = -2 \sec(4x) + 2$

Amp = none
Per = $\pi/2$
PS = none
US = 2

9. $y = 3 \csc(4x)$

Amp = ~~3~~ none
Per = $\pi/2$
PS = none
US = none

13. $y = -3 \cos(6x + \pi)$

Amp = 3
Per = $\pi/3$
PS = $-\pi/6$
US = none

$(x + \frac{\pi}{6})$

10. $y = 2 \cot(x + \frac{\pi}{2})$

Amp = ~~2~~ none
Per = π
PS = $-\pi/2$
US = none

14. $y = 2 - \sin(\frac{2}{3}x)$

Amp = 1
Per = 3π
PS = none
US = 2

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

Write an equation of the graph described.

15. A cosine curve with a period of 4π and an amplitude of 3 that has been phase shifted right by $\frac{\pi}{2}$ and vertically displaced upwards by 2.

Per = $\frac{2\pi}{b}$
 $\frac{4\pi}{1} = \frac{2\pi}{b}$
 $4\pi b = 2\pi$
 $b = 1/2$

$a = 3$
 $b = 1/2$
 $c/b = \frac{\pi}{2}$
 $d = 2$

$y = 3 \cos \frac{1}{2}(x - \frac{\pi}{2}) + 2$

16. A sine curve with a period of π and an amplitude of 2 that has been phase shifted left by $\frac{\pi}{2}$ and vertically displaced downwards by 1.

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

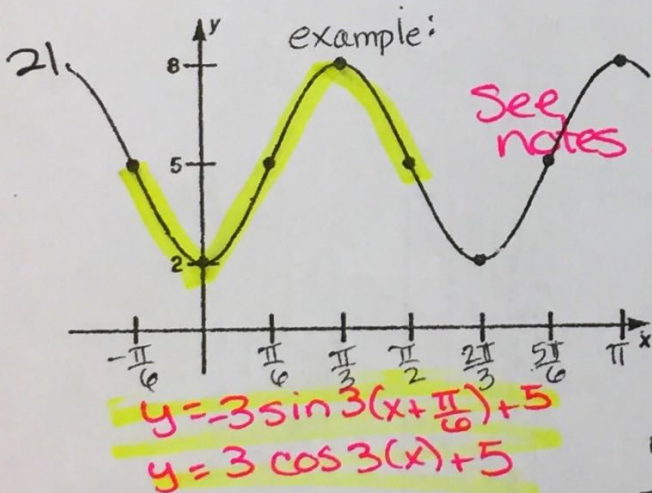
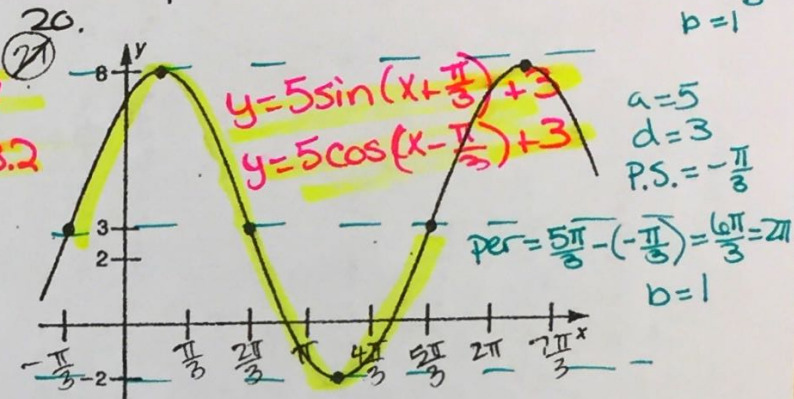
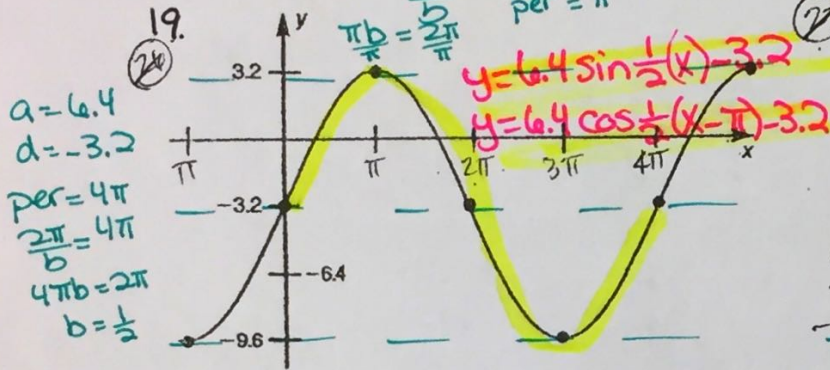
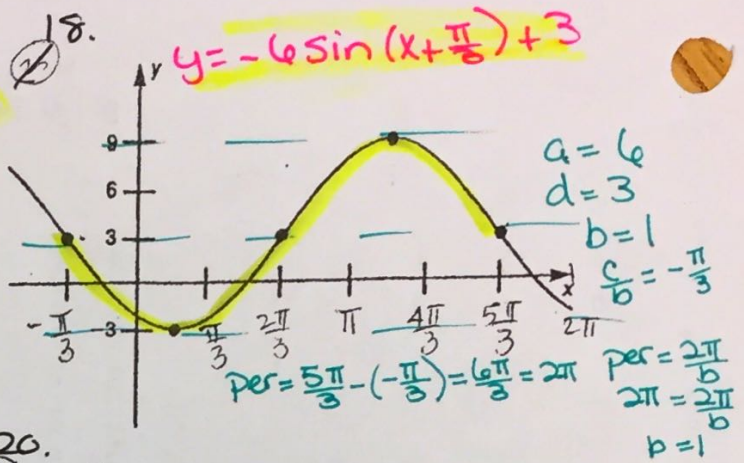
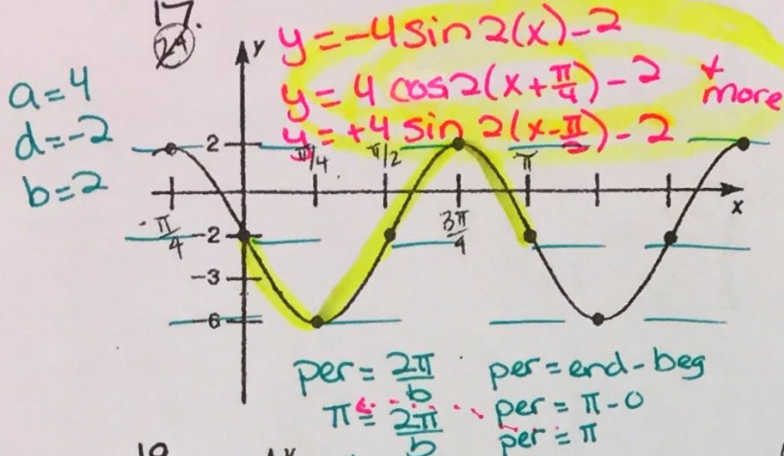
$a = 2$
 $b = 2$
 $c/b = -\pi/2$
 $d = -1$

$y = 2 \sin 2(x + \frac{\pi}{2}) - 1$

$$y = a \cos(bx + c) + d$$

$$y = a \sin(bx + c) + d$$

Write the particular equation of the sinusoid graphed.



To start these problems, find the total height.

Amplitude = $|a| = \frac{1}{2}$ total height.

In the example, total height is 6, therefore $a=3$. Find the middle of the graph next. (from top to bottom). It is at 5, so $d=5$.

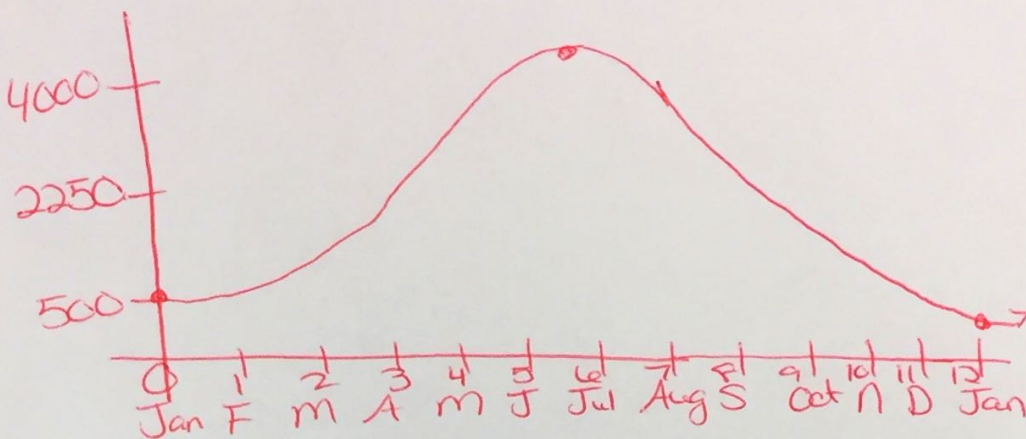
Next, find one "period" of the graph (one complete picture). This example has one period from 0 to $\frac{2\pi}{3}$ on the x-axis.

So $\frac{2\pi}{3} = \text{period} = \frac{2\pi}{b}$ Solve $\frac{2\pi}{3} = \frac{2\pi}{b} \rightarrow b=3$

Now decide if this graph looks like $y = \sin x$, $y = -\sin x$, $y = \cos x$ or $y = -\cos x$. (It can look like all of them, but just starting at a different point.) In the example, it can be a $-\cos x$ graph starting at 0. Then $y = 3 \cos(3x) + 5$ is a correct answer! But it also could be a $-\sin$ graph starting at $-\frac{\pi}{6}$. So $-\frac{\pi}{6} = \text{phase shift} = -\frac{c}{b}$. $y = -3 \sin 3(x + \frac{\pi}{6}) + 5$

$y = -3 \sin(3x + \frac{\pi}{2}) + 5$ is also correct.

22.
~~28.~~
 # of
 visitors



$$\text{max} = 500(8) = 4000$$

$$\text{midline} = \frac{500 + 4000}{2} = 2250$$

$$a = 1750$$

$$d = 2250$$

$$b = \pi/6$$

$$\text{per} = 2\pi/b$$

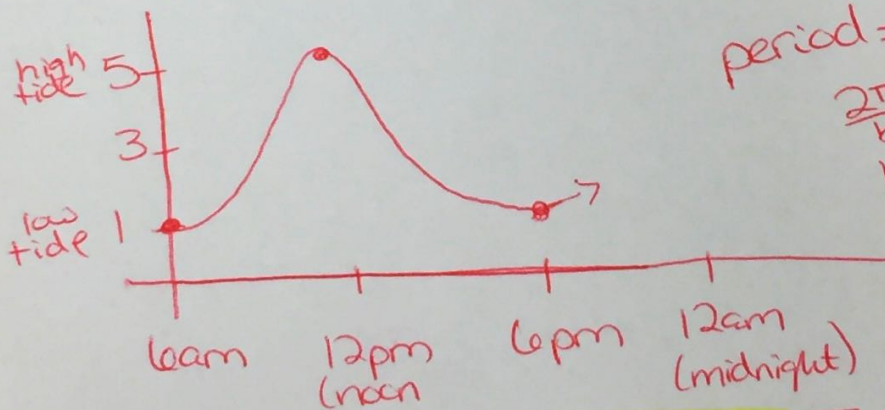
$$12 = \frac{2\pi}{b}$$

$$\frac{12b}{12} = \frac{2\pi}{12}$$

$$b = \pi/6$$

$$y = -1750 \cos \frac{\pi}{6}(\theta) + 2250$$

23.
~~29.~~



period = 12 hrs (until it repeats)

$$\frac{2\pi}{b} = 12$$

$$12b = 2\pi$$

$$b = \pi/6$$

$$a = 2$$

$$d = 3$$

$$y = -2 \cos \frac{\pi}{6}(\theta) + 3$$