2.13 Unit 2 Review: Graphing Trig Functions & Sinusoidal Modeling   Date: ________

State the requested characteristics of each function. Graph at least one period of the function.

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

1. $y = \sin\left(\frac{\theta}{4} + \frac{3\pi}{8}\right) + 1$

$y = \sin\left[\frac{1}{4}\left(\theta + \frac{3\pi}{2}\right)\right] + 1$ $a = 1$ $b = 1/4$ $c = 3\pi/2$ $d = 1$

$= \frac{2\pi}{1/4} = 8\pi$

Amplitude 1

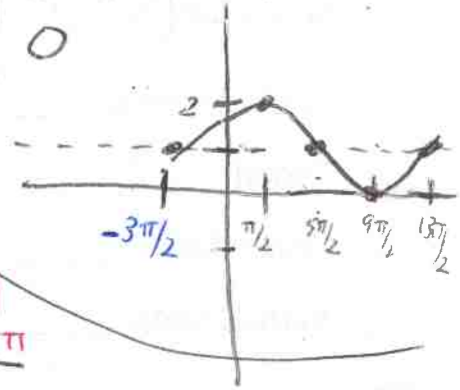
Period 8π

$I = 2\pi$

Phase Shift left $3\pi/2$

Vertical Shift up 1

θ	$0 - \frac{3\pi}{2}$ ($\boxed{-3\pi/2}$)	$2\pi - \frac{3\pi}{2}$ ($\boxed{\pi/2}$)	$4\pi - \frac{3\pi}{2}$ ($\boxed{5\pi/2}$)	$6\pi - \frac{3\pi}{2}$ ($\boxed{9\pi/2}$)	$8\pi - 3\pi/2$ ($\boxed{13\pi/2}$)
$\sin\theta$	0	1	0	−1	0
$\sin\theta$	0	1	0	−1	0



*think $\cos\theta$

2. $y = -4\sec(\theta - \pi) - 2$

$a = -4$ $b = 1$ $c = \pi$ $d = -2$

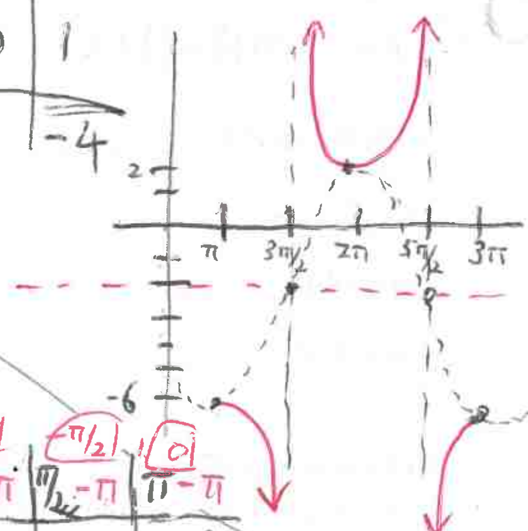
Vertical Stretch 4

Period 2π

Phase Shift right π

Vertical Shift down 2

θ	$0 + \pi$ (π)	$\frac{\pi}{2} + \pi$ ($3\pi/2$)	$\pi + \pi$ (2π)	$\frac{3\pi}{2} + \pi$ ($5\pi/2$)	$2\pi + \pi$ (3π)
$\sec\theta$	1	0	−1	0	1
$-4\sec\theta$	−4	0	4	0	−4



$y = 5\tan\left[\frac{1}{2}(\theta + \pi)\right] + 3$ $a = 5$ $b = 1/2$ $c = \pi$ $d = 3$

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

Vertical Stretch 5

Period 2π

Phase Shift left π

Vertical Shift up 3

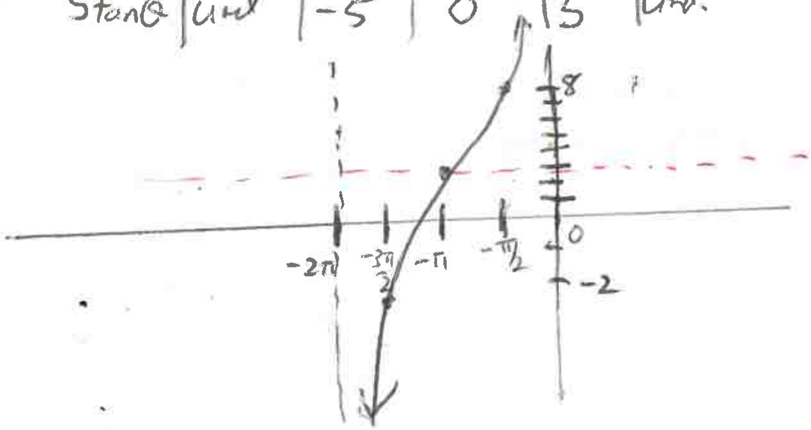
θ	$-\pi - \pi$ (-2π)	$-\pi/2 - \pi$ ($-3\pi/2$)	$0 - \pi$ ($-\pi$)	$\pi/2 - \pi$ ($-\pi/2$)	$\pi - \pi$ (0)
$\tan\theta$	und	−1	0	1	und
$5\tan\theta$	und	−5	0	5	und.

*period $= \frac{\pi}{b}$

period $= \frac{\pi}{1/2}$

period $= 2\pi$

$I = \frac{1}{4} \cdot 2\pi = \frac{\pi}{2}$



$y = \frac{1}{2}\cot\left[2\left(\theta + \frac{\pi}{2}\right)\right] - 1$

4. $y = 0.5\cot(2\theta + \pi) - 1$

Vertical Stretch compress by ½

Period $\pi/2$

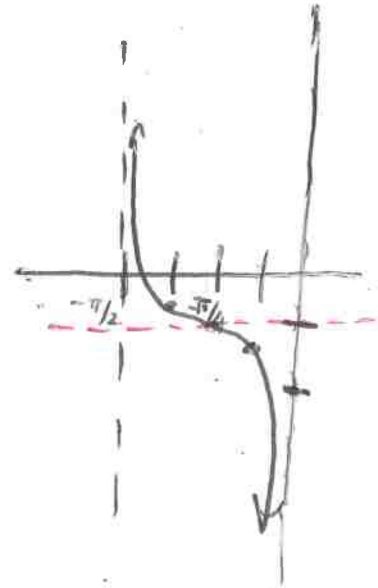
Phase Shift left $\pi/2$

Vertical Shift down 1

	$-\pi/2$	$-3\pi/8$	$-\pi/4$	$-\pi/8$	0
θ	$0 - \frac{\pi}{2}$	$1\pi/8 - \frac{4\pi}{8}$	$2\pi/8 - \frac{4\pi}{8}$	$3\pi/8 - \frac{4\pi}{8}$	$4\pi/8 - \frac{4\pi}{8}$
$\cot\theta$	und	1	0	−1	und
$\frac{1}{2}\cot\theta$	und	½	0	−½	und.

*period $= \frac{\pi}{b} = \frac{\pi}{2}$

$I = \frac{1}{4}\cdot P \rightarrow \frac{1}{4}\cdot\frac{\pi}{2} = \frac{\pi}{8}$



Write two functions for each graph using the specified functions.

5. Using sine: $y = 2\sin\left[4\left(\theta + \frac{\pi}{8}\right)\right] + 1$

Using cosine: $y = 2\cos[4(\theta)] + 1$

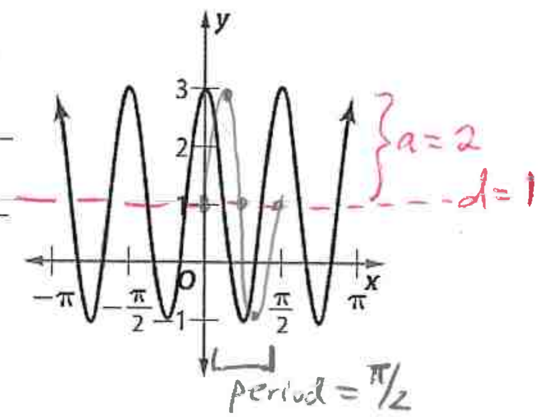
*start w/ cosine graph

$a = 2$ | period $= \frac{2\pi}{b}$ | $I = \frac{1}{4}\cdot P$

$b = $ ___ | $\frac{\pi}{2} = \frac{2\pi}{b}$ | $I = \frac{1}{4}\cdot\frac{\pi}{2} = \frac{\pi}{8}$

$c = 0$

$d = 1$ | $b\pi = 4\pi$ $b = 4$



6. Using sine: $y = 4\sin\left[\frac{1}{2}(\theta)\right] - 2$

Using cosine: $y = 4\cos\left[\frac{1}{2}(\theta - \pi)\right] - 2$

*start with sine equation:

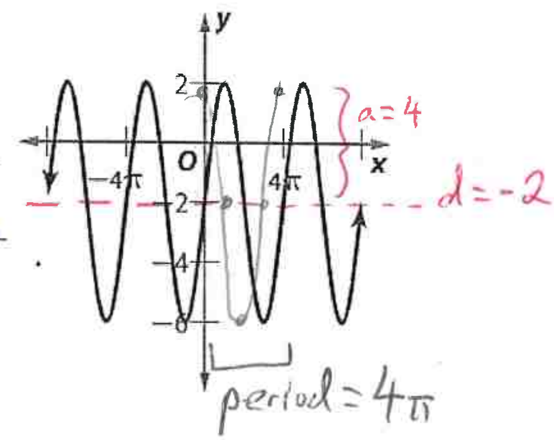
$a = 4$ | period $= \frac{2\pi}{b}$ | $I = \frac{1}{4}\cdot P$

$b = $ ½ | $4\pi = \frac{2\pi}{b}$ | $I = \frac{1}{4}\cdot 4\pi = \pi$

$c = 0$

$d = -2$ | $4\pi b = 2\pi$

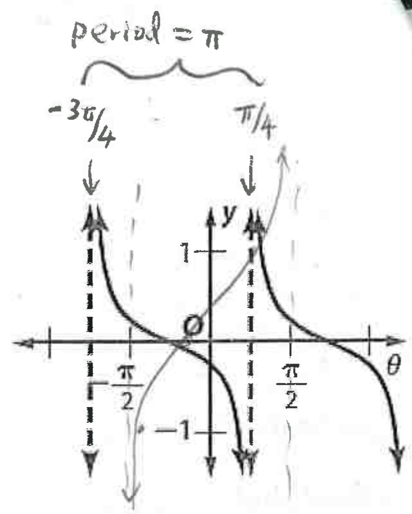
$b = \frac{2\pi}{4\pi} = ½$



7. Using tangent: $y = -\tan\left[\theta + \pi/4\right]$

Using cotangent: $y = \cot\left[\theta - \frac{\pi}{4}\right] + 0$

*start with cot θ



a = 1
b = 1
c =
d = 0

8. True or False, and explain why: Every sine function of the form $y = a\sin b(x - c) + d$ can also be written as a cosine function of the form $y = a\cos b(x - c) + d$.

True, since every cosine and sine functions are shifted versions of each other

$*\cos(\theta) = \sin(\theta + \pi/2)$

9. True or False, and explain why: The period of $f(x) = \cos 8\theta$ is equal to four times the period of $g(x) = \cos 2\theta$.

$f(x) = \cos(8\theta)$
$b = 8$
$\text{period} = \frac{2\pi}{b} \to \frac{2\pi}{8} = \frac{\pi}{4}$

$g(x) = \cos(2\theta)$
$b = 2$
$\text{period} = \frac{2\pi}{b} \to \frac{2\pi}{2} = \pi$

False
Since cos 2θ has period π, cos(2θ) has period 4 times that of cos(8π) → (π/4)

10. True or False, and explain why: If $x = \theta$ is an asymptote of $y = \csc x$, then $x = \theta$ is also an asymptote of $y = \cot x$.

θ	0	$\pi/4$	$\pi/2$	$3\pi/4$	π	
csc x	0		1		0	
cot x	0 und				0 und	

* from sin x

$\csc x = \frac{1}{\sin x}$

$\cot x = \frac{\cos x}{\sin x}$

whenever sin x = 0, both csc x and cot x are undefined, therefore they share same asymptotes.

11. How many zeros does $y = \cos 1500\theta$ have on the interval from $0 \le \theta \le 2\pi$?

b = 1500

* For context, cos(θ) has 2 zeros
→ cos(2θ) means graph will complete 2 full cycle in 2π → means 2 × 2 = 4 zeros

cos(1500θ) means 1500 cycle within (2π)

$1500 \times 2 = \boxed{3000 \text{ zeros}}$