1. List the domains and ranges:

	Sine	Cosine	Arcsine	Arccosine	Arctangent
Domain	$(-\infty, \infty)$	$(-\infty, \infty)$	$[-1, 1]$	$[-1, 1]$	$(-\infty, \infty)$
Range	$[-1, 1]$	$[-1, 1]$	$[-\pi/2, \pi/2]$	$[0, \pi]$	$(-\pi/2, \pi/2)$

2. Explain how to find the amplitude and vertical shift of a sinusoidal curve when given the max and min.

$\text{Amp} = \frac{\text{Max} - \text{Min}}{2}$ Vert Shift (D) $= \frac{\text{Max} + \text{Min}}{2}$

3. Explain how to find the max and min of a sinusoidal curve when given the amplitude and vertical shift.

Max = D + A Min = D − A

4. Explain how you would find the period of a sinusoidal curve when given the x-values of a consecutive max and min.

$(x_{max} - x_{min}) \times 2 = \text{Period}$

II. The times S of sunset (Greenwich Mean Time) at 40° north latitude on the 15th of each month are given the following equation: $S(t) = 18.09 + 1.41\sin\left(\frac{\pi}{6}t + 4.60\right)$

The month is represented by t, with $t = 1$ corresponding to January. Minutes have been converted to the decimal part of an hour for this data.

5. What is the period of the model? Is it what you expected? Explain.

$\frac{\pi}{6} = \frac{2\pi}{P}$ } $P = \frac{2\pi \cdot 6}{\pi}$ $P = 12$ mths Yes, 1 year = 12 mths

6. What is the amplitude of the function? What does it represent in the model? Explain.

$A = 1.41$ Average sunset = 18.09, therefore max/min $= 18.09 \pm 1.41$

7. Rework the problems in your Trig Applications Task and visit this website for more practice writing equations (4 practice problems) for sinusoidal applications:
http://www.algebralab.org/Word/Word.aspx?file=Trigonometry_SineModels2.xml

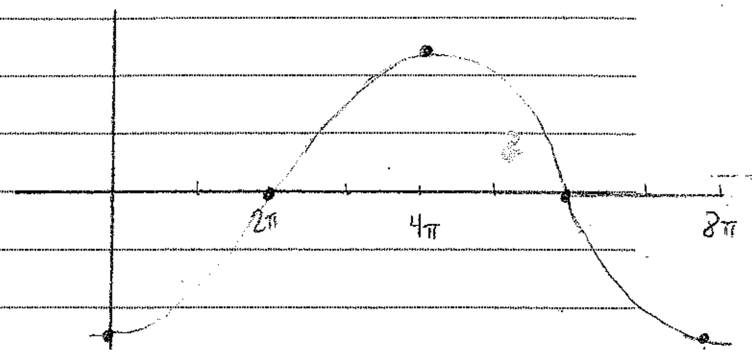
III. Graphing: Be able to identify all transformations and characteristics given a trig function (such as domain, range, horizontal/vertical shifts, period, amplitude or vertical stretch/compression, and reflections).

8. Graph: a.) $f(x) = -\frac{5}{2}\cos\frac{x}{4}$ b.) $f(x) = 4\sin\left(x - \frac{\pi}{2}\right)$

c.) $f(x) = \sec\left(\frac{1}{2}x - \frac{\pi}{2}\right) + 3$ d.) $f(x) = 3\tan 2x - 1$

8a) $y = -\frac{5}{2}\cos\left(\frac{x}{4}\right)$

	x	$\cos x$		
0	0	1	$-5/2$	$-2\frac{1}{2}$
2π	$\pi/2$	0	0	
4π	π	-1	$5/2$	$2\frac{1}{2}$
6π	$3\pi/2$	0	0	
8π	2π	1	$-5/2$	$2\frac{1}{2}$
	$\times 4$	$\times(-5/2)$		



$B = \frac{\text{orig}}{P}$

$P = \frac{a}{B} = \frac{2\pi}{1/4}$

8π

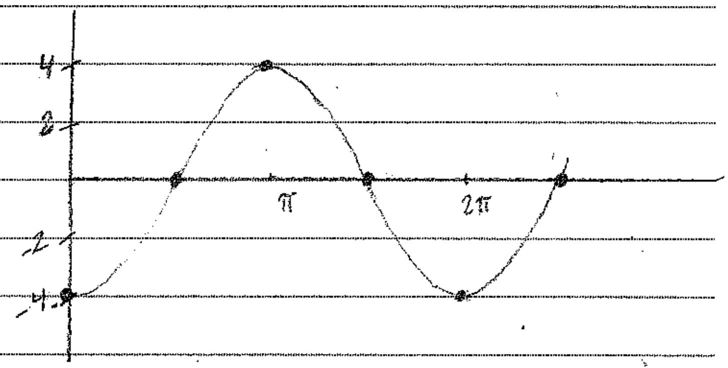
D: $(-\infty, \infty)$ { No H. Shift { $P = 8\pi$ { V. Refl: x-axis { Axis: $y=0$

R: $[-2\frac{1}{2}, 2\frac{1}{2}]$ { No V. Shift { $A = 2\frac{1}{2}$ { Horiz str by 4

Vert str by $2\frac{1}{2}$

8b) $y = 4\sin\left(x - \frac{\pi}{2}\right)$

	x	$\sin x$	
$\pi/2$	0	0	0
π	$\pi/2$	1	4
$3\pi/2$	π	0	0
2π	$3\pi/2$	-1	-4
$2\frac{1}{2}\pi$	2π	0	0
$+\pi/2$		$\times 4$	

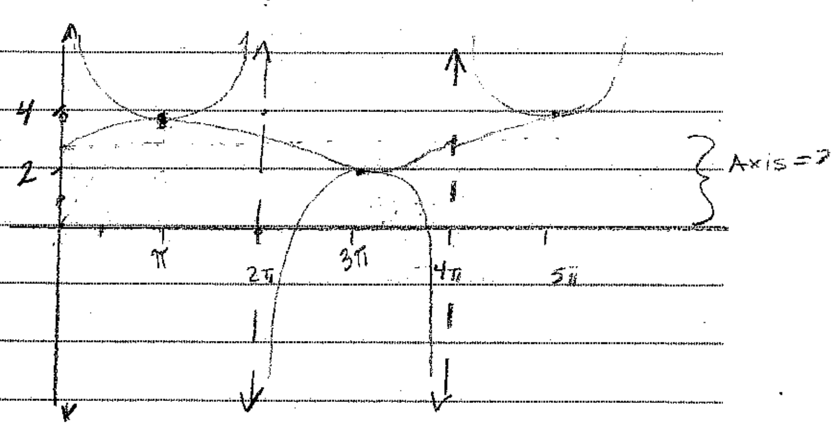


D: $(-\infty, \infty)$ { Hor: Rt. $\pi/2$ { $P = 2\pi$ { Axis: $y = 0$

R: $[-4, 4]$ { V: none { $A = 4$ { ← vert str by 4

8c) $y = \sec\left(\frac{1}{2}x - \frac{\pi}{2}\right) + 3 = \sec\left(\frac{1}{2}(x - \pi)\right) + 3$

		x	$1/\cos$	
π	0	0	$1/1$	4
2π	π	$\pi/2$	$1/0$ asymp	und
3π	2π	π	$1/-1$	2
4π	3π	$3\pi/2$	$1/0$ asymp	und
5π	4π	2π	$1/1$	4
$+\pi$	$\times 2$		$+3$	



or $2\pi k$

D: $x \neq \pi + k2\pi$ { Hor: Rt π { Hor str by 2

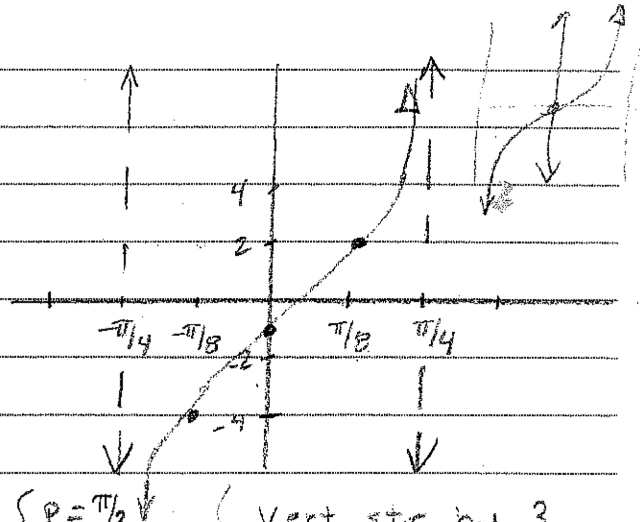
R: $(-\infty, 2] \cup [4, \infty)$ { V: Up 3 }

Period: 4π

Asymp: $x = 2\pi k$

d) $y = 3\tan(2x) - 1$

	x			
$-\pi/4$	$-\pi/2$	asymptote und	u	u
$-\pi/8$	$-\pi/4$	-1	-3	-4
0	0	0	0	-1
$\pi/8$	$\pi/4$	$+1$	$+3$	2
$\pi/4$	$\pi/2$	asymptote und	u	u
$x(1/2)$		$\times 3$	-1	



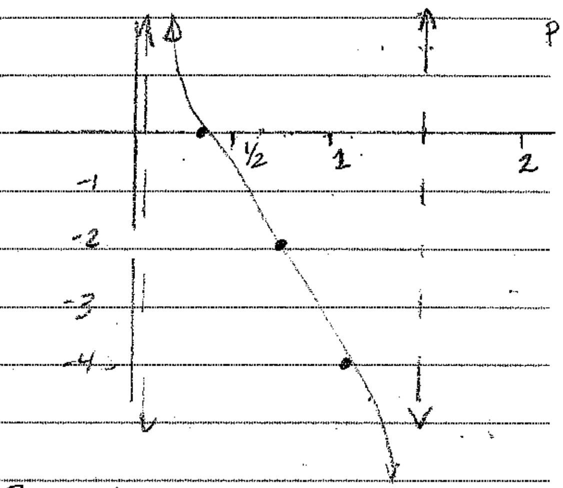
D: $x \neq \pi/4 + k\pi/2$ { H. Shift: none { $P = \pi/2$ { Vert str by 3

R: $(-\infty, \infty)$ | V. Shift - Dn 1 | Hor comp by $1/2$

e) $f(x) = 2\cot\left(\frac{2\pi}{3}x\right) - 2$

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

	x	$1/\tan$		
0	0	asymptote u	u	u
$3/8$	$\pi/4$	$+1$	2	0
$3/4$	$\pi/2$	0	0	-2
$9/8$	$3\pi/4$	-1	-2	-4
$3/2$	π	asymptote u	u	u
$x\left(\frac{3}{2\pi}\right)$			$\times 2$	-2

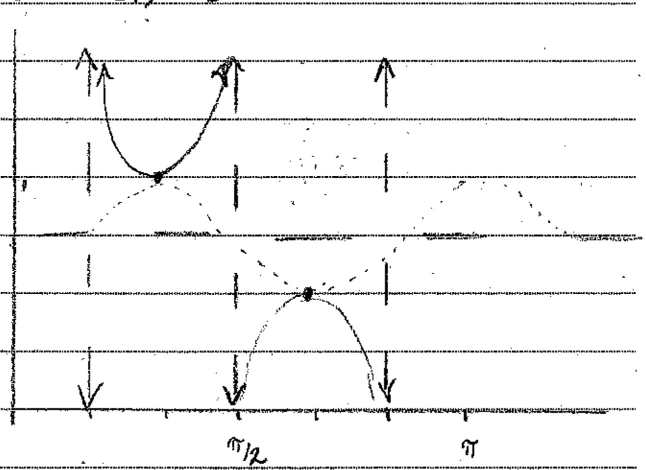


D: $x \neq k\frac{3}{2}$ { H. Shift: none { $P = \frac{3}{2}$ { Vert Str: by 2

R: $(-\infty, \infty)$ | V. Shift: Dn 2 | Hor Comp by $\frac{3}{2\pi}$

f) $f(x) = \csc\left(3x - \frac{\pi}{2}\right) + 3 = \csc\left(3(x - \pi/6)\right) + 3$ $\quad \sin(3(x - \pi/6)) + 3$

		x	$1/\sin x$	
$\pi/6$	0	0	asymp u	u
$\pi/3$	$\pi/6$	$\pi/2$	1	4
$\pi/2$	$\pi/3$	π	u	u
$2\pi/3$	$\pi/2$	$3\pi/2$	-1	2
$5\pi/6$	$2\pi/3$	2π	asymp u	u
$+\pi/6$	$x\,1/3$		$+3$	



D: $x \neq \frac{\pi}{6} + k\frac{\pi}{3}$ { H Shift: Rt $\pi/6$ { $P = 2\pi/3$ { Hor. Comp of $1/3$

R: $(-\infty, 2] \cup [4, \infty)$ { VShift: Up 3 e.) $f(x) = 2\cot\left(\frac{2\pi}{3}x\right) - 2$

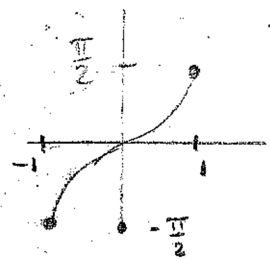
f. $f(x) = \csc\left(3x - \frac{\pi}{2}\right) + 3$

IV. Write a sinusoidal equation with the given characteristics.

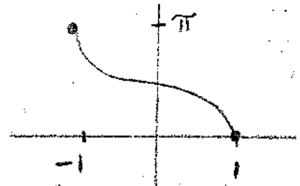
9. Sine Curve Max is 20 ft Min is 2 ft Period is 2.5 minutes	10. Starts at a minimum Sinusoidal axis is y=112 Amplitude is 27 Distance between a consecutive max and min is 10	11. Starts at the center and is falling Min is -10 Amplitude is 25 Period is 12π
$A = \frac{20-2}{2} = \frac{18}{2} = 9$ | $P = \frac{2\pi}{2.5} = \frac{4\pi}{5}$ $D = \frac{20+2}{2} = 11$ $y = 9\sin \frac{4\pi}{5}x + 11$	$P = 2(10) = 20$ $B = \frac{2\pi}{20} = \frac{\pi}{10}$ $y = -27\cos\left(\frac{\pi}{10}x\right) + 112$	Max = 40, Min = -10 $> D = \frac{40+(-10)}{2} = 15$ $B = \frac{2\pi}{12\pi} = \frac{1}{6}$ $y = -25\sin\left(\frac{1}{6}x\right) + 15$

V. Inverse Trig Functions

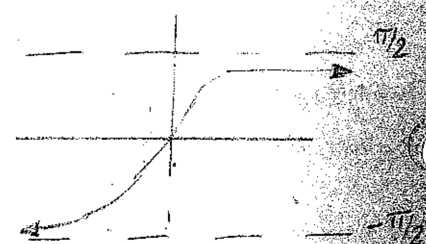
12. Graph the parent graphs for the three inverse trig functions.



arcsin



arccos



arc tan

13. Explain why the domain and range are limited to the values they are.

Arcsin : D: [-1, 1] - orig Range Range: [$-\frac{\pi}{2}$, π/2] for function status

Arccos : D: [-1, 1] - orig Range Range: [0, π] " "

Arctan: D = R of orig tang.
R = limited to $(-\frac{\pi}{2}, \frac{\pi}{2})$ for function status

Vertical line test