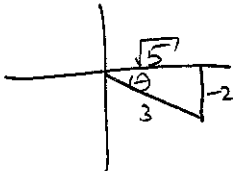


[a]

$$\cot(\sin^{-1}(-\frac{2}{3}))$$
$$\theta = \sin^{-1}(-\frac{2}{3})$$
$$\sin \theta = -\frac{2}{3}, \theta \in [-\frac{\pi}{2}, \frac{\pi}{2}]$$

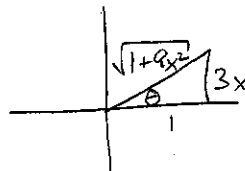
so θ in Q_4


$$\cot \theta = -\frac{\sqrt{5}}{2}$$

[b]

$$\csc(\arctan 3x), \text{ where } x > 0$$
$$\theta = \arctan 3x$$
$$\tan \theta = 3x, \theta \in (-\frac{\pi}{2}, \frac{\pi}{2})$$

so θ in Q_1


$$\csc \theta = \frac{3x}{\sqrt{1+9x^2}}$$

Find the coordinates of the 9 points discussed in lecture, corresponding to 2 complete periods, starting at the phase shift. Label all x - and y - values for the 9 points on the appropriate axes, using a consistent scale for each axis.

MIDDLE = -3

AMPLITUDE = $|-5| = 5$

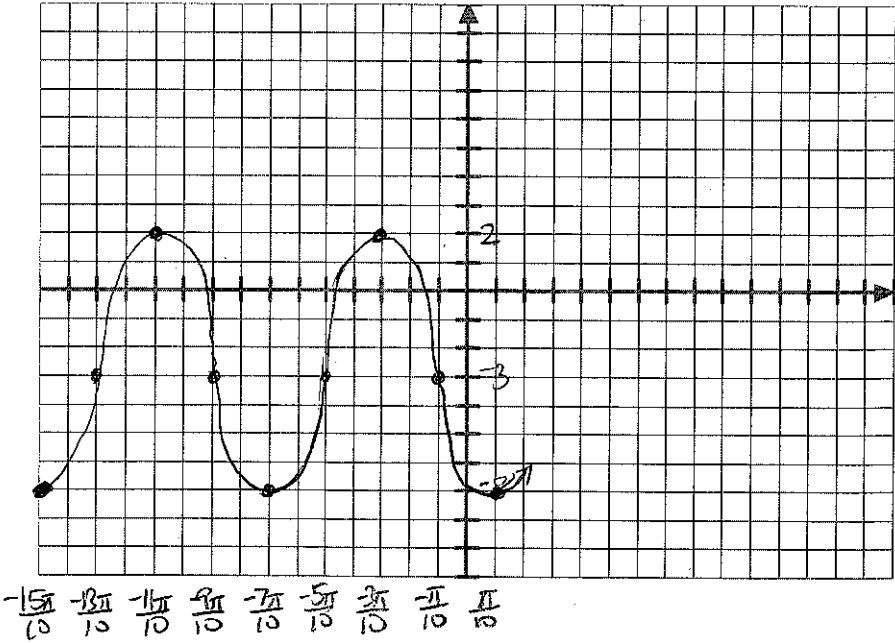
PERIOD = $\frac{2\pi}{\frac{5}{2}} = 2\pi \cdot \frac{2}{5} = \frac{4\pi}{5} \rightarrow \frac{1}{4}$ PERIOD = $\frac{\pi}{5} = \frac{2\pi}{10}$

MAX = $-3 + 5 = 2$

MIN = $-3 - 5 = -8$

PHASE SHIFT $\frac{5}{2}x + \frac{15\pi}{4} = 0$
 $\frac{5}{2}x = -\frac{15\pi}{4}$
 $x = -\frac{3\pi}{2} = -\frac{15\pi}{10}$

- POINTS:
- ($-\frac{15\pi}{10}$, -8)
 - ($-\frac{13\pi}{10}$, -3)
 - ($-\frac{11\pi}{10}$, 2)
 - ($-\frac{9\pi}{10}$, -3)
 - ($-\frac{7\pi}{10}$, -8)
 - ($-\frac{5\pi}{10}$, -3)
 - ($-\frac{3\pi}{10}$, 2)
 - ($-\frac{\pi}{10}$, -3)
 - ($\frac{\pi}{10}$, -8)

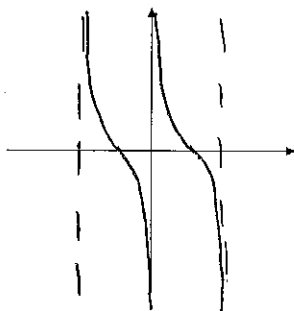


Sketch the graphs. **For periodic functions, sketch at least 2 periods.**

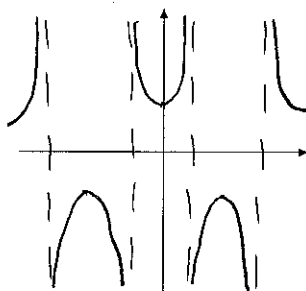
SCORE: ____ / 12 PTS

You only need to get the general position and shape correct. Do NOT plot points.

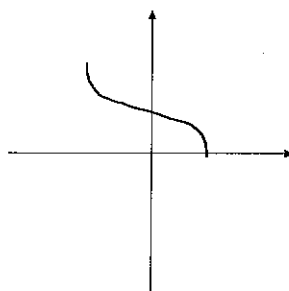
[a] $y = \cot x$



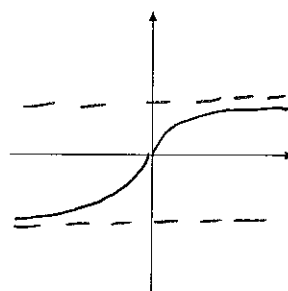
[b] $y = \sec x$



[c] $y = \cos^{-1} x$



[d] $y = \tan^{-1} x$



Fill in the blanks. Write "DNE" if the question has no answer.

SCORE: ____ / 32 PTS

[a] The range of $f(x) = \cos^{-1} x$ is $[0, \pi]$.

[b] The domain of $f(x) = \tan x$ is $x \neq \frac{\pi}{2} + n\pi$.

[c] As $x \rightarrow \frac{\pi}{2}^+$, $\sec x \rightarrow$ $-\infty$.

[d] As $x \rightarrow 0^-$, $\cot x \rightarrow$ $-\infty$.

[e] $\tan^{-1}(-1) =$ $-\frac{\pi}{4}$.

[f] $\arccos(-\frac{\sqrt{2}}{2}) =$ $\frac{3\pi}{4}$.

[g] $\sin^{-1} \frac{1}{2} =$ $\frac{\pi}{6}$.

[h] $\arctan \sqrt{3} =$ $\frac{\pi}{3}$.

[i] $\cos^{-1}(\cos \frac{4\pi}{3}) =$ $\frac{2\pi}{3}$. $\cos^{-1}(-\frac{1}{2})$

[j] $\tan(\tan^{-1} 2) =$ 2 .

[k] $\sin(\arcsin 2) =$ DNE.

[l] $\arccos(\cos \frac{3\pi}{4}) =$ $\frac{3\pi}{4}$.

[m] The domain of $f(x) = \arcsin x$ is $[-1, 1]$.

[n] The range of $f(x) = \sec x$ is $(-\infty, -1] \cup [1, \infty)$.

[o] The equations of the asymptotes of $f(x) = \tan^{-1} x$ are

$y = \pm \frac{\pi}{2}$.

[p] The equations of the asymptotes of $f(x) = \csc x$ are

$x = n\pi$.

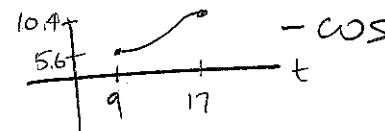
CJ does not have a regular sleep routine, so the amount of sleep she gets each night fluctuates up and down.

SCORE: ____ / 12 PTS

She got the least sleep (5.6 hours) on the 9th day after the start of the quarter,

and her sleep increased continually to a high of 10.4 hours on the 17th day after the start of the quarter, before starting to decrease.

- [a] Assuming that the amount of sleep CJ gets each night corresponds to a sinusoidal function, find an equation for the amount of sleep she gets on the t^{th} day after the start of the quarter.



$$\text{MIDDLE} = \frac{5.6 + 10.4}{2} = 8$$

$$\text{AMPLITUDE} = \frac{10.4 - 5.6}{2} = 2.4$$

$$\frac{1}{2} \text{ PERIOD} = 17 - 9 = 8$$

$$\text{PERIOD} = 16 = \frac{2\pi}{B} \rightarrow B = \frac{2\pi}{16} = \frac{\pi}{8}$$

$$-2.4 \cos \frac{\pi}{8}(t - 9) + 8$$

- [b] Based on the answer of [a], how much sleep will CJ get on the 32nd day of the quarter?

$$-2.4 \cos \frac{\pi}{8}(32 - 9) + 8 \approx 10.2 \text{ HOURS}$$

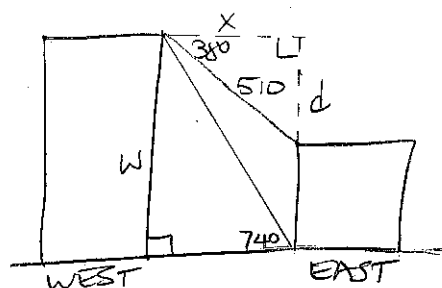
A 510 foot cable connects the roofs of two buildings.

SCORE: ____ / 16 PTS

From the base of the east building, the angle of elevation to the roof of the west building is 74° .

From the roof of the west building, the angle of depression to the roof of the east building is 38° .

- [a] Find the height of each building. (You may need to calculate other information that is not explicitly requested.)



$$\cos 38^\circ = \frac{X}{510} \rightarrow X = 510 \cos 38^\circ = 402$$

$$\tan 74^\circ = \frac{W}{402} \rightarrow W = 402 \tan 74^\circ = 1402$$

$$\sin 38^\circ = \frac{d}{510} \rightarrow d = 510 \sin 38^\circ = 314$$

$$\text{WEST} = 1402 \text{ FEET}$$

$$\text{EAST} = 1402 - 314 = 1088 \text{ FEET}$$

- [b] Find the angle of depression from the roof of the west building to the base of the east building.

$$= \text{ANGLE OF ELEVATION FROM BASE OF EAST TO ROOF OF WEST}$$

$$= 74^\circ$$