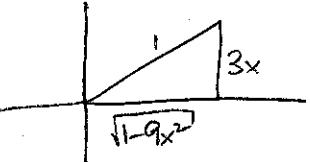


[a] $\cot(\arcsin 3x)$, where $x > 0$

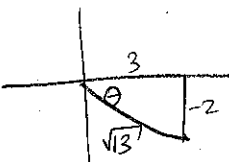
$\theta = \arcsin 3x$
 $\sin \theta = 3x, \theta \in [-\frac{\pi}{2}, \frac{\pi}{2}]$
so $\theta \in Q_1$



$\cot \theta = \frac{\sqrt{1-9x^2}}{3x}$

[b] $\csc(\tan^{-1}(-\frac{2}{3}))$

$\theta = \tan^{-1}(-\frac{2}{3})$
 $\tan \theta = -\frac{2}{3}, \theta \in (-\frac{\pi}{2}, \frac{\pi}{2})$
so $\theta \in Q_4$

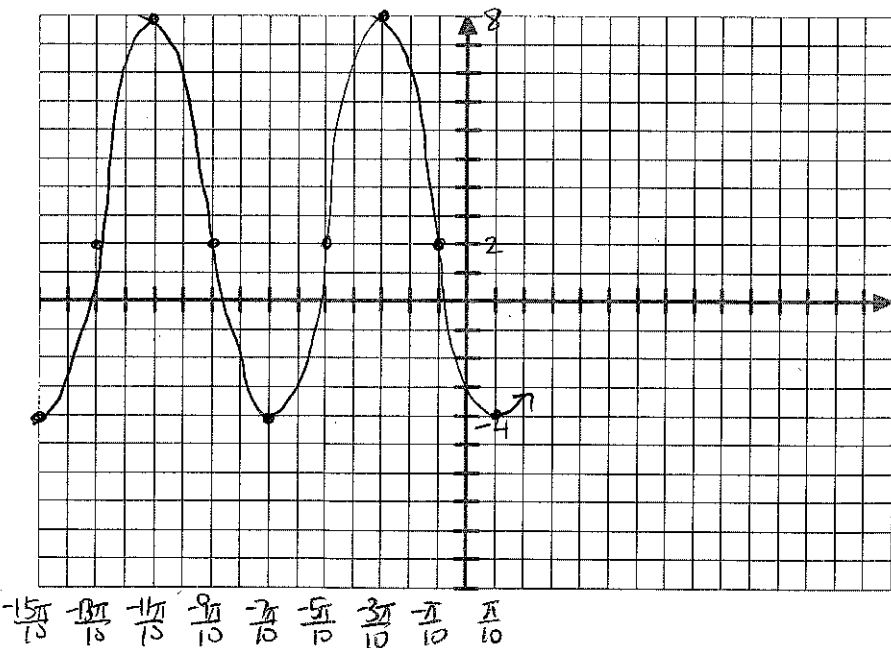


$\csc \theta = -\frac{\sqrt{13}}{2}$

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.

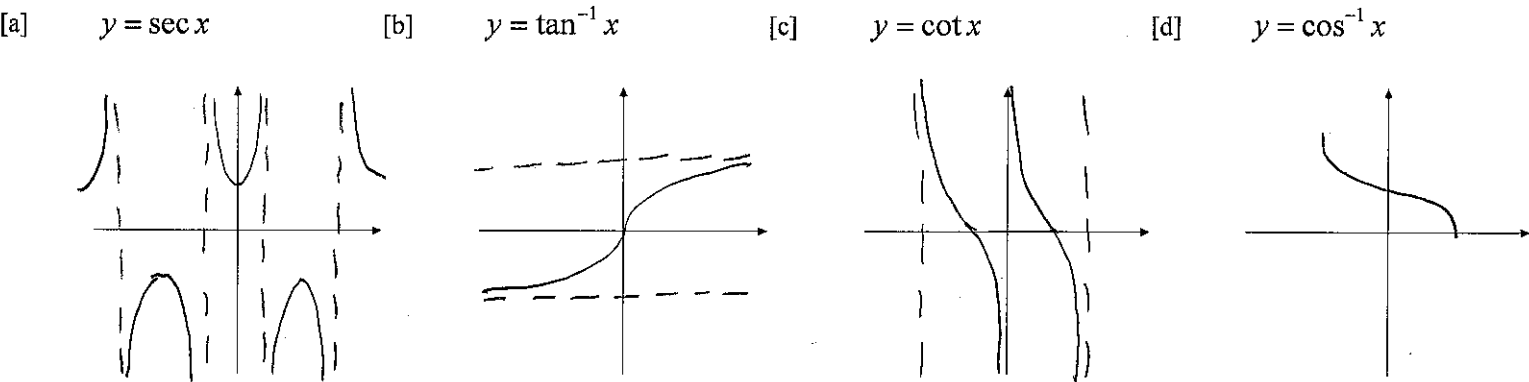
MIDDLE = 2 MAX = 2 + 6 = 8 PHASE SHIFT $\frac{5}{2}x + \frac{15\pi}{4} = 0$
AMPLITUDE = $|-6| = 6$ MIN = 2 - 6 = -4 $\frac{5}{2}x = -\frac{15\pi}{4}$
PERIOD = $\frac{2\pi}{\frac{5}{2}} = 2\pi \cdot \frac{2}{5} = \frac{4\pi}{5} \rightarrow \frac{1}{4}$ PERIOD = $\frac{\pi}{5} = \frac{2\pi}{10}$ $x = -\frac{3\pi}{2} = -\frac{15\pi}{10}$

- POINTS:
- ($-\frac{15\pi}{10}$, -4)
 - ($-\frac{13\pi}{10}$, 2)
 - ($-\frac{11\pi}{10}$, 8)
 - ($-\frac{9\pi}{10}$, 2)
 - ($-\frac{7\pi}{10}$, -4)
 - ($-\frac{5\pi}{10}$, 2)
 - ($-\frac{3\pi}{10}$, 8)
 - ($-\frac{\pi}{10}$, 2)
 - ($\frac{\pi}{10}$, -4)



Sketch the graphs. For periodic functions, sketch at least 2 periods.
You only need to get the general position and shape correct. Do NOT plot points.

SCORE: ____ / 12 PTS



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

SCORE: ____ / 32 PTS

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

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

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

[g] As $x \rightarrow 0^-$, $\cot x \rightarrow \underline{-\infty}$.

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

[k] The equations of the asymptotes of $f(x) = \csc x$ are $x = n\pi$.

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

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

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

[d] $\sin(\arcsin 2) = \underline{\text{DNE}}$.

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

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

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

[l] The equations of the asymptotes of $f(x) = \tan^{-1} x$ are $y = \pm \frac{\pi}{2}$.

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

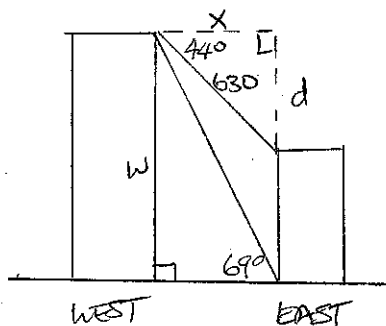
[p] $\sin^{-1} \frac{1}{2} = \underline{\frac{\pi}{6}}$.

A 630 foot cable connects the roofs of two buildings.

From the base of the east building, the angle of elevation to the roof of the west building is 69° .

From the roof of the west building, the angle of depression to the roof of the east building is 44° .

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



$$\cos 44^\circ = \frac{x}{630} \rightarrow x = 630 \cos 44^\circ = 453$$

$$\tan 69^\circ = \frac{W}{453} \rightarrow W = 453 \tan 69^\circ = 1180$$

$$\sin 44^\circ = \frac{d}{630} \rightarrow d = 630 \sin 44^\circ = 438$$

$$\text{WEST} = 1180 \text{ FEET}$$

$$\text{EAST} = 1180 - 438 = 742 \text{ FEET}$$

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

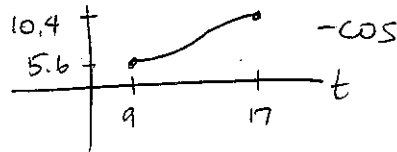
$$\begin{aligned} &= \text{ANGLE OF ELEVATION FROM BASE OF EAST TO ROOF OF WEST} \\ &= 69^\circ \end{aligned}$$

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

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.

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

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

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

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

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

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

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