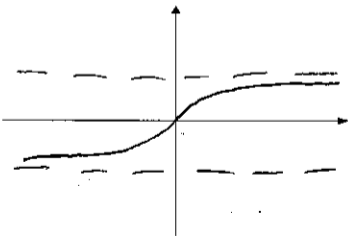


Sketch the graphs. For periodic functions, sketch at least 2 periods.

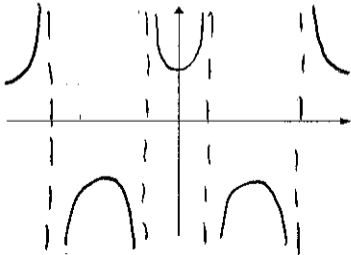
SCORE: ____ / 12 PTS

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

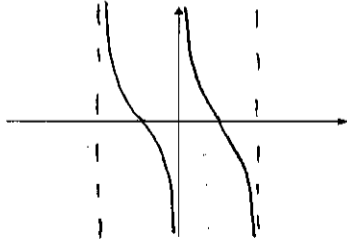
[a] $y = \arctan x$



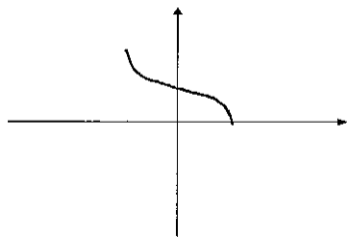
[b] $y = \sec x$



[c] $y = \cot x$



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



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

SCORE: ____ / 28 PTS

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

The domain of $f(x) = \tan x$ is $x \neq \frac{\pi}{2} + n\pi, n \in \mathbb{Z}$

The domain of $f(x) = \sin^{-1} x$ is $[-1, 1]$

The range of $f(x) = \arccos x$ is $[0, \pi]$

The **equations** of the asymptotes of $f(x) = \csc x$ are

The **equations** of the asymptotes of $f(x) = \arctan x$ are

$$\underline{x = n\pi, n \in \mathbb{Z}}$$

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

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

$\arcsin \frac{\sqrt{2}}{2} =$ $\frac{\pi}{4}$

$\cos^{-1}(-\frac{\sqrt{3}}{2}) =$ $\frac{5\pi}{6}$

$\arctan(-\sqrt{3}) =$ $-\frac{\pi}{3}$

$\tan(\tan^{-1} 7) =$ 7

$\arctan(\tan \frac{3\pi}{4}) =$ $-\frac{\pi}{4}$

$\sin(\sin^{-1} \frac{3}{2}) =$ DNE

$\arccos(\cos \frac{2\pi}{3}) =$ $\frac{2\pi}{3}$

Simplify the following expressions completely. Show proper reasoning to justify your answer.

SCORE: ____ / 14 PTS

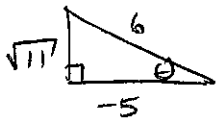
[a] $\tan(\cos^{-1}(-\frac{5}{6})) = \tan \theta = -\frac{\sqrt{11}}{5}$

$$\theta = \cos^{-1}(-\frac{5}{6})$$

$$\cos \theta = -\frac{5}{6}, \theta \in [0, \pi]$$

i.e. θ in Q_1 or Q_2

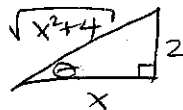
$$\cos \theta < 0 \rightarrow \theta \text{ in } Q_2$$



[b] $\csc(\arctan \frac{2}{x})$, where $x > 0$

$$\theta = \arctan \frac{2}{x}$$

$$\tan \theta = \frac{2}{x}$$



$$\csc(\arctan \frac{2}{x}) = \csc \theta = \frac{\sqrt{x^2 + 4}}{2}$$

Graph 2 periods of the function $y = -4 \cos(\frac{4}{3}x + \frac{11\pi}{6}) - 3$.



SCORE: ____ / 16 PTS

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.

$$\text{MID} = -3$$

$$\text{AMP} = |-4| = 4$$

$$\text{MAX} = -3 + 4 = 1$$

$$\text{MIN} = -3 - 4 = -7$$

$$\text{PERIOD} = \frac{2\pi}{\frac{4}{3}} = 2\pi \cdot \frac{3}{4} = \frac{3\pi}{2}$$

$$\frac{1}{4} \text{ PERIOD} = \frac{3\pi}{8}$$

$$\text{START } \frac{4}{3}x + \frac{11\pi}{6} = 0 \rightarrow \frac{4}{3}x = -\frac{11\pi}{6} \rightarrow x = -\frac{11\pi}{8} \cdot \frac{3}{4} = -\frac{11\pi}{8}$$

POINTS:

$$\left(\frac{-11\pi}{8}, -7 \right)$$

$$\left(\frac{-8\pi}{8}, -3 \right)$$

$$\left(\frac{-5\pi}{8}, 1 \right)$$

$$\left(\frac{-2\pi}{8}, -3 \right)$$

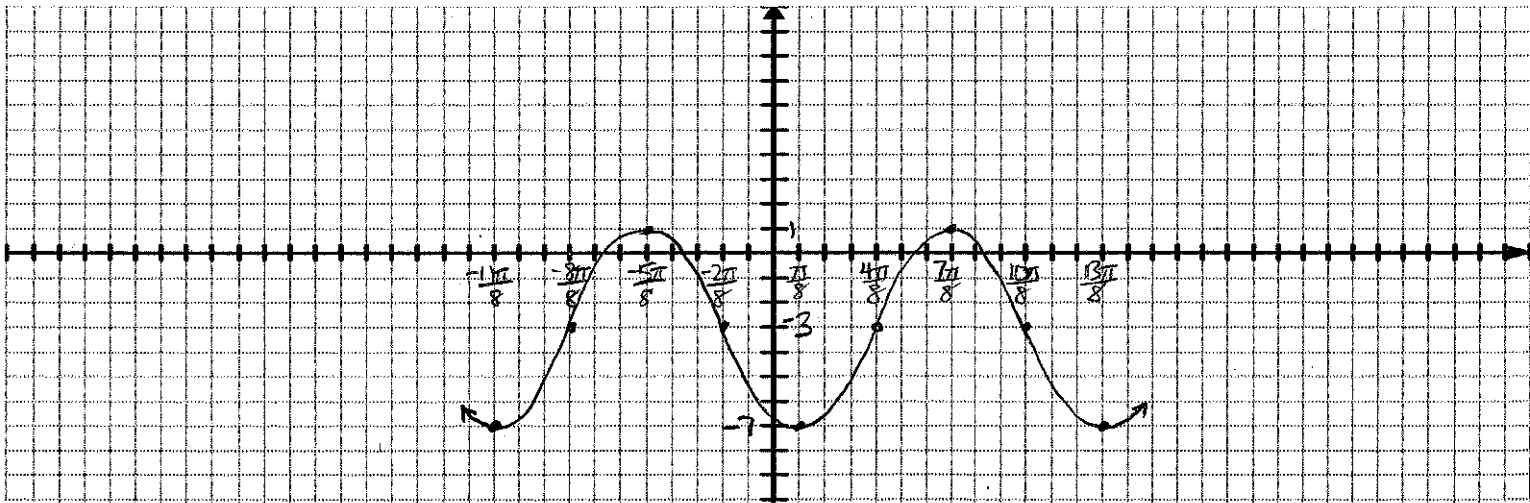
$$\left(\frac{\pi}{8}, 7 \right)$$

$$\left(\frac{4\pi}{8}, -3 \right)$$

$$\left(\frac{7\pi}{8}, 1 \right)$$

$$\left(\frac{10\pi}{8}, -3 \right)$$

$$\left(\frac{13\pi}{8}, 7 \right)$$



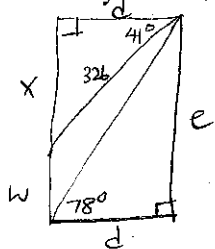
A 326 foot cable connects the roofs of two buildings.

From the base of the west building, the angle of elevation to the roof of the east building is 78° .

From the roof of the east building, the angle of depression to the roof of the west building is 41° .

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

Round your answers to the nearest integer. **You may only use techniques covered in lecture so far.**



$$\cos 41^\circ = \frac{d}{326} \rightarrow d = 326 \cos 41^\circ = 246$$

$$\sin 41^\circ = \frac{x}{326} \rightarrow x = 326 \sin 41^\circ = 214$$

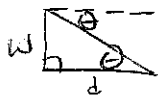
$$\tan 78^\circ = \frac{e}{d} \rightarrow e = d \tan 78^\circ = 246 \tan 78^\circ = 1157$$

$$w = e - x = 1157 - 214 = 943$$

EAST 1157 FT , WEST 943 FT

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

Round your answer to the nearest integer.



$$\tan \theta = \frac{w}{d} \rightarrow \theta = \tan^{-1} \frac{w}{d} = \tan^{-1} \frac{943}{246} = 75^\circ$$

Due to a malfunction, the temperature in a lab freezer has been behaving like a sinusoidal function.

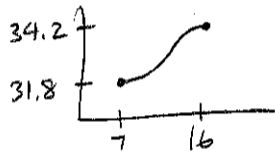
SCORE: _____ / 14 PTS

At 12:07pm, the temperature reached a low of $31.8^\circ F$, then increased until it reached a high of $34.2^\circ F$ at 12:16pm.

- [a] Find an equation for the temperature in the freezer at t minutes after noon.

$$\text{MID} = \frac{34.2 + 31.8}{2} = 33$$

$$\text{AMP} = \frac{34.2 - 31.8}{2} = 1.2$$



$$-1.2 \cos \frac{\pi}{9}(t-7) + 33$$

START $t=7$

PERIOD $2(16-7) = 18 = \frac{2\pi}{B} \rightarrow B = \frac{2\pi}{18} = \frac{\pi}{9}$

- [b] Find the temperature in the freezer at 1pm. (Round your answer to 1 decimal point.)

$$-1.2 \cos \frac{\pi}{9}(60-7) + 33 = 31.9^\circ$$