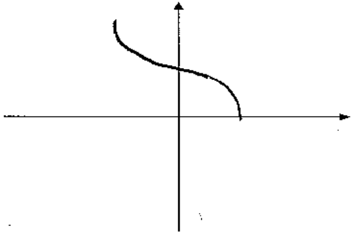
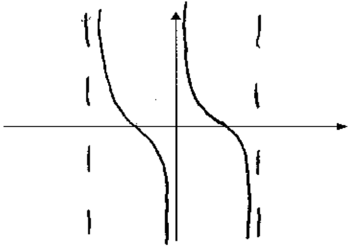
Sketch the graphs. **For periodic functions, sketch at least 2 periods.** SCORE: _____ / 12 PTS

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

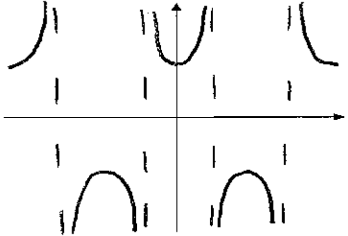
[a] $y = \arccos x$



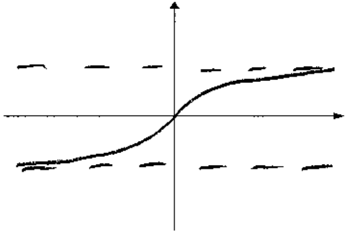
[b] $y = \cot x$



[c] $y = \sec x$



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



Fill in the blanks. Write "DNE" if the question has no answer. **SCORE: _____ / 28 PTS**

$\arcsin(-\frac{\sqrt{2}}{2}) =$ $-\frac{\pi}{4}$

As $x \to \frac{\pi}{2}^+$, $\tan x \to$ $-\infty$

$\arctan\frac{\sqrt{3}}{3} =$ $\frac{\pi}{6}$

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

$\tan^{-1}(\tan\frac{5\pi}{6}) =$ $-\frac{\pi}{6}$

$\tan(\arctan 3) =$ $3$

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

$\cos(\arccos\frac{4}{3}) =$ DNE

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

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

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

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

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

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

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

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

Graph 2 periods of the function $y = -5\cos(\frac{5}{3}x + \frac{13\pi}{6}) + 2$.  **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.

MID = 2

AMP = |−5| = 5

MAX = 2+5 = 7

MIN = 2−5 = −3

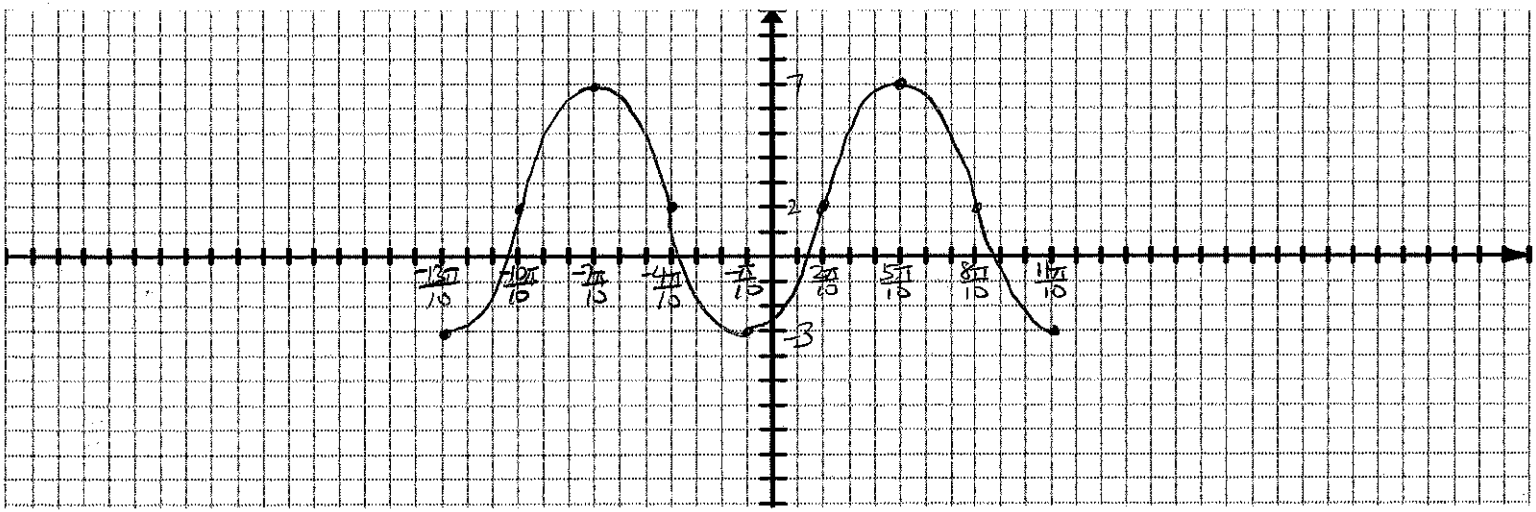
$\text{PERIOD} = \frac{2\pi}{\frac{5}{3}} = 2\pi \cdot \frac{3}{5} = \frac{6\pi}{5}$

$\frac{1}{4}\text{ PERIOD} = \frac{1}{\cancel{4}_2} \cdot \frac{\cancel{6}^3\pi}{5} = \frac{3\pi}{10}$

$\text{START } \frac{5}{3}x + \frac{13\pi}{6} = 0 \longrightarrow \frac{5}{3}x = \frac{-13\pi}{6} \longrightarrow x = \frac{-13\pi}{\cancel{6}_2} \cdot \frac{\cancel{3}}{5} = \frac{-13\pi}{10}$

POINTS: $(\frac{-13\pi}{10}, -3)$ $(\frac{-10\pi}{10}, 2)$ $(\frac{-7\pi}{10}, 7)$ $(\frac{-4\pi}{10}, 2)$ $(\frac{-\pi}{10}, -3)$

$(\frac{2\pi}{10}, 2)$ $(\frac{5\pi}{10}, 7)$ $(\frac{8\pi}{10}, 2)$ $(\frac{11\pi}{10}, -3)$

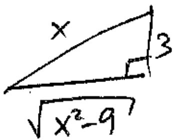


Simplify the following expressions completely. Show proper reasoning to justify your answer. **SCORE: _____ / 14 PTS**

[a] $\sec(\sin^{-1}\frac{3}{x})$, where $x > 0$

$\theta = \sin^{-1}\frac{3}{x}$

$\sin\theta = \frac{3}{x}$




$\sec(\sin^{-1}\frac{3}{x}) = \sec\theta = \frac{x}{\sqrt{x^2-9}}$

$= \frac{x\sqrt{x^2-9}}{x^2-9}$

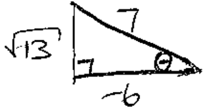
[b] $\tan(\arccos(-\frac{6}{7})) = \tan\theta = -\frac{\sqrt{13}}{6}$

$\theta = \arccos(-\frac{6}{7})$

$\cos\theta = -\frac{6}{7}$, $\theta \in [0, \pi]$

IE. $\theta$ IN $Q_1$ OR $Q_2$

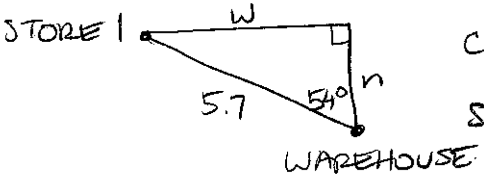
$\cos\theta < 0 \rightarrow \theta$ IN $Q_2$



A truck travels 5.7 miles from a warehouse to a store on a bearing of N $54^\circ$ W, **SCORE: _____ / 18 PTS**

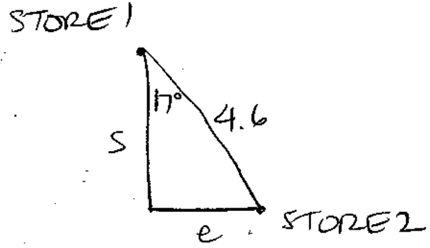
then changes direction and travels another 4.6 miles on a bearing of S $17^\circ$ E to a second store.

[a] Find the straight-line distance from the warehouse to the second store. **You may only use techniques covered in lecture so far.** Round your answers to 1 decimal place. **You may need to calculate other information that is not explicitly requested.**




$\cos 54^\circ = \frac{n}{5.7} \longrightarrow n = 5.7 \cos 54^\circ = 3.4$

$\sin 54^\circ = \frac{w}{5.7} \longrightarrow w = 5.7 \sin 54^\circ = 4.6$

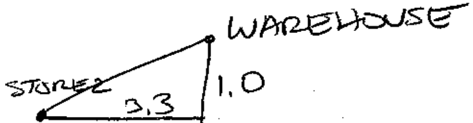



$\cos 17^\circ = \frac{s}{4.6} \longrightarrow s = 4.6 \cos 17^\circ = 4.4$

$\sin 17^\circ = \frac{e}{4.6} \longrightarrow e = 4.6 \sin 17^\circ = 1.3$

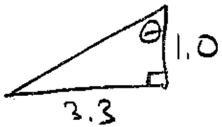
TOTAL SOUTH $4.4 - 3.4 = 1.0$

WEST $4.6 - 1.3 = 3.3$




[b] Find the bearing of the second store from the warehouse. Use the same format for bearing as in the question. Round your answer to the nearest integer.

DISTANCE $= \sqrt{3.3^2 + 1.0^2} = 3.4$ MI




$\tan \theta = \frac{3.3}{1.0} \longrightarrow \theta = \tan^{-1} 3.3 = 73^\circ$

FINAL BEARING S $73^\circ$ W

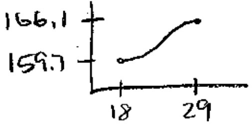
BJ has unhealthy eating habits, which causes his weight to fluctuate up and down. **SCORE: _____ / 12 PTS**

On Jan 19th, his weight reached a low of $159.7$ pounds, then increased until it reached a high of $166.1$ pounds on Jan 30th.

Assuming that BJ's weight corresponds to a sinusoidal function, find an equation for BJ's weight on the $t^{th}$ day after Jan 1st.

$$\text{MID} = \frac{166.1+159.7}{2} = 162.9$$

$$\text{AMP} = \frac{166.1-159.7}{2} = 3.2$$




$$-3.2\cos\frac{\pi}{11}(t-18)+162.9$$

START $t=18$ (DAYS AFTER JAN 1)

PERIOD $2(29-18) = 22 = \frac{2\pi}{B} \rightarrow B = \frac{2\pi}{22} = \frac{\pi}{11}$