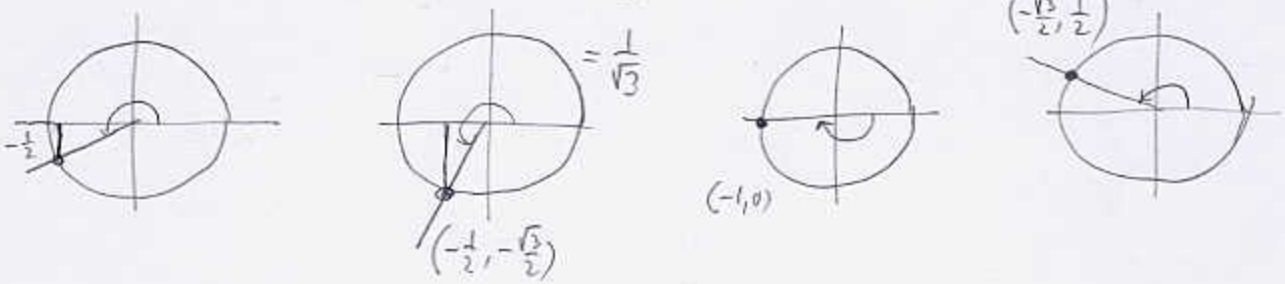
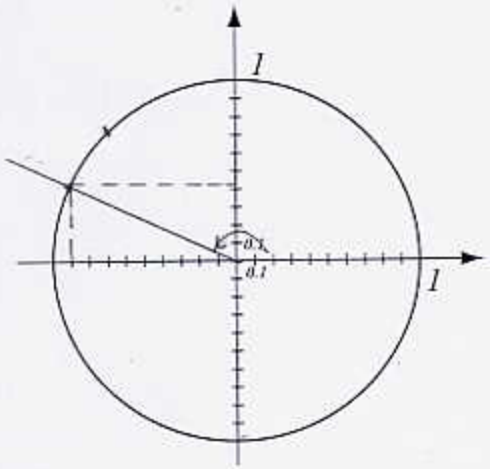
Fall '06/MAT 150/Worksheet 8 **Name:** Solution *Show all your work.*

1. (8pts) Without using the calculator, find the exact values of the following trigonometric expressions. Draw the unit circle and the appropriate angle under the expression.

$\sin 210° = -\frac{1}{2}$ $\cot\frac{4\pi}{3} = \frac{x}{y} = \frac{-\frac{1}{2}}{-\frac{\sqrt{3}}{2}} = \frac{1}{\sqrt{3}}$ $\sec(-\pi) = \frac{1}{\cos(-\pi)} = -1$ $\tan 150° = \frac{y}{x} = \frac{\frac{1}{2}}{-\frac{\sqrt{3}}{2}} = -\frac{1}{\sqrt{3}}$



2. (4pts) Use the picture below to estimate $\sin\frac{7\pi}{8}$ and $\cos\frac{7\pi}{8}$. Then evaluate with a calculator and compare the results.

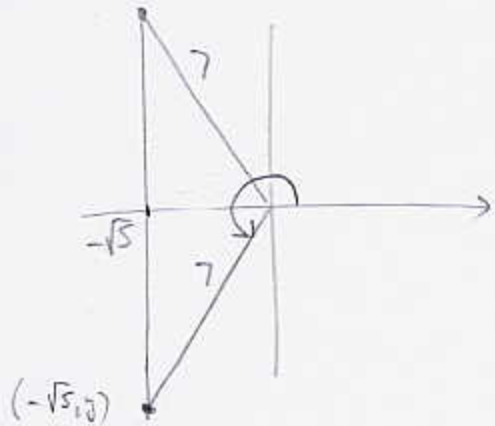


Calculator:

$\sin\frac{7\pi}{8} \approx 0.42$ $\sin\frac{7\pi}{8} \approx 0.38$

$\cos\frac{7\pi}{8} \approx -0.91$ $\cos\frac{7\pi}{8} \approx -0.92$

3. (5pts) If $\cos\theta = -\frac{\sqrt{5}}{7}$ and θ is in the third quadrant, find $\sin\theta$, $\cot\theta$, $\sec\theta$. Draw a picture.



$\cos\theta = \frac{x}{r} = \frac{-\sqrt{5}}{7}$

$(-\sqrt{5})^2 + y^2 = 7^2$

$5 + y^2 = 49$

$y^2 = 44$

$y = \pm\sqrt{44} = \pm 2\sqrt{11}$

$y = -2\sqrt{11}$ since θ in 3rd quadrant

$\sin\theta = -\frac{2\sqrt{11}}{7}$

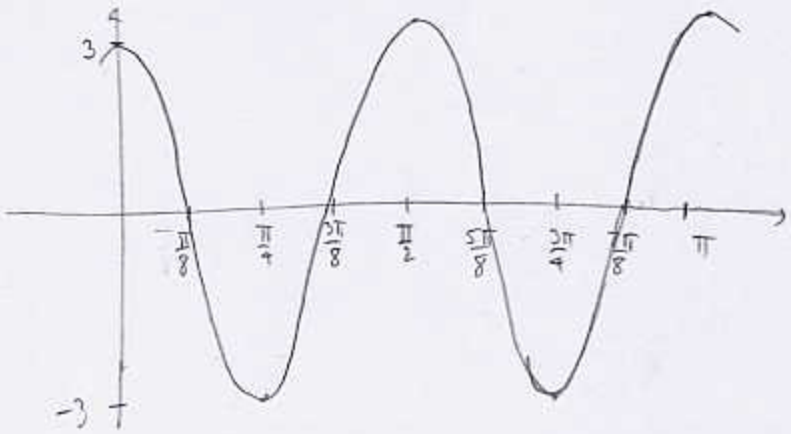
$\cot\theta = \frac{-\frac{\sqrt{5}}{7}}{-\frac{2\sqrt{11}}{7}} \cdot \frac{7}{7} = \frac{\sqrt{5}}{2\sqrt{11}}$

$\sec\theta = \frac{1}{\cos\theta} = -\frac{7}{\sqrt{5}}$

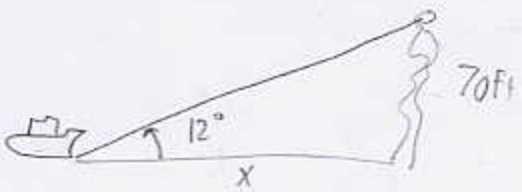
4. (5pts) Draw two periods of the graph of $y = 3\cos(4x)$. What is the amplitude? The period? Indicate where the special points are (x-intercepts, peaks, valleys).

$A = 3$

$\text{period} = 2\pi \cdot \frac{1}{4} = \frac{\pi}{2}$



5. (5pts) A ship, offshore from a statue known to be 70ft tall, takes a sighting of the top of the statue. If the angle of elevation is 12°, how far offshore is the ship?

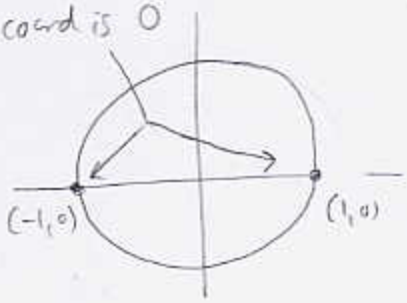


$$\frac{70}{x} = \tan 12^\circ$$

$$x = \frac{70}{\tan 12^\circ} \approx 329.324 \text{ ft}$$

6. (3pts) Use the unit circle to find the domain of $\cot\theta$.

points where y-coord is 0



$\cot\theta = \frac{x}{y}$ not defined when $y = 0$

$\theta = 0 + k \cdot 2\pi = 0, \pm 2\pi, \pm 4\pi, \ldots$

or $\theta = \pi + k \cdot 2\pi = \pm\pi, \pm 3\pi, \pm 5\pi, \ldots$

May combine: $\theta = n\pi$, n an integer

Domain $= \{\theta \mid \theta \neq n\pi \text{ for some integer } n\}$