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.
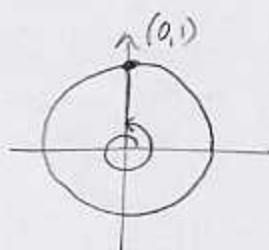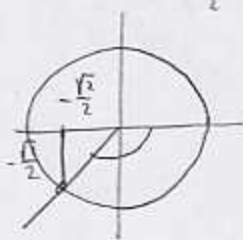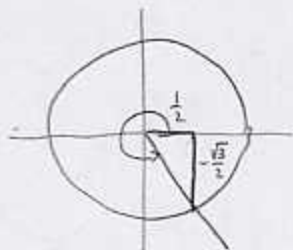
$$\sin 120° = \frac{\sqrt{3}}{2} \qquad \tan\frac{5\pi}{3} = \frac{y}{x} = \frac{-\frac{\sqrt{3}}{2}}{\frac{1}{2}} \qquad \csc(-135°) = \frac{1}{\sin\theta} \qquad \cos\frac{5\pi}{2} = 0$$

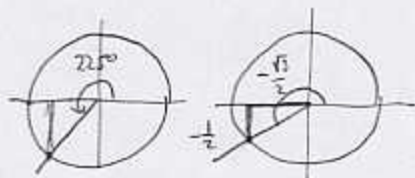$$= -\sqrt{3} \qquad\qquad = \frac{1}{-\frac{\sqrt{2}}{2}} = -\frac{2}{\sqrt{2}} = -\sqrt{2}$$

2. (3pts) Use exact values of trigonometric functions to evaluate the following expressions:

$$\cos^2 225° + \tan^2 210° = \left(-\frac{\sqrt{2}}{2}\right)^2 + \left(\frac{1}{\sqrt{3}}\right)^2 = \frac{2}{4} + \frac{1}{3} = \frac{1}{2} + \frac{1}{3} = \frac{5}{6}$$

$$\tan 210° = \frac{-\frac{1}{2}}{-\frac{\sqrt{3}}{2}} = \frac{1}{\sqrt{3}}$$

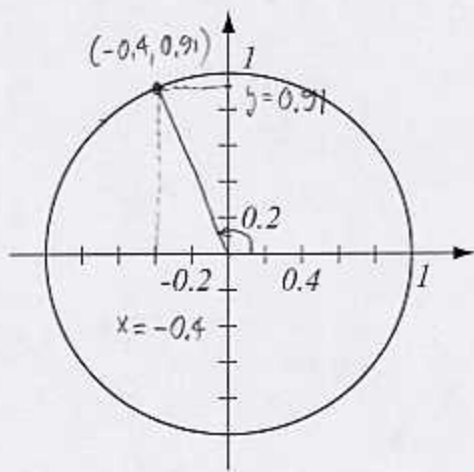**3.** (4pts) Use your calculator to evaluate (round to 4 decimals):

$$\cot 140° = \frac{1}{\tan 140°}$$

$$\sec\frac{3\pi}{7} = \frac{1}{\cos\frac{3\pi}{7}} = 4.4940$$

$$= -1.1917$$

4. (4pts) Use the picture below to estimate $\sin\frac{5\pi}{8}$ and $\cos\frac{5\pi}{8}$. Compare your answer with results you get with a calculator.
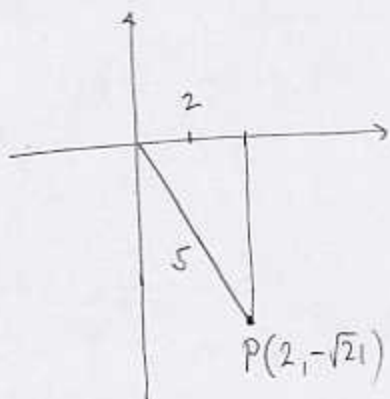
Calculator:

$\cos\frac{5\pi}{8} \approx -0.4 \longrightarrow -0.38$

$\sin\frac{5\pi}{8} \approx 0.91 \longrightarrow 0.92$

fairly close

$(-0.4, 0.91)$
$y = 0.91$
0.2
-0.2 0.4 1
$x = -0.4$

5. (5pts) If $\cos\theta = \frac{2}{5}$ and θ is in the fourth quadrant, find $\sin\theta$, $\tan\theta$, $\sec\theta$.

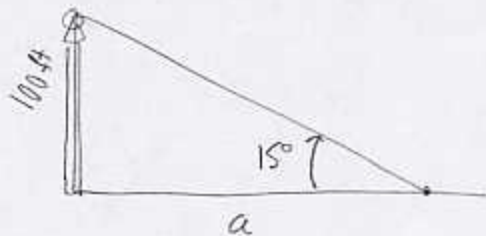$P(2, -\sqrt{21})$

$y^2 + 2^2 = 5^2$

$y^2 = 21$

$y = -\sqrt{21}$
because
is 4th
quadrant

$x = 2, \ r = 5$

$\sin\theta = \frac{y}{r} = -\frac{\sqrt{21}}{5}$

$\tan\theta = \frac{y}{x} = -\frac{\sqrt{21}}{2}$

$\sec\theta = \frac{1}{\cos\theta} = \frac{5}{2}$

6. (6pts) A ship, offshore from a lighthouse known to be 100ft tall, takes a sighting of the top of the lighthouse. If the angle of elevation is 15°, how far offshore is the ship?

100.4

15°
a

$\tan 15° = \frac{100}{a}$

$a = \frac{100}{\tan 15°}$

$= 373.21 \ ft$