10:32 - 10:39 10:45 - 10:57

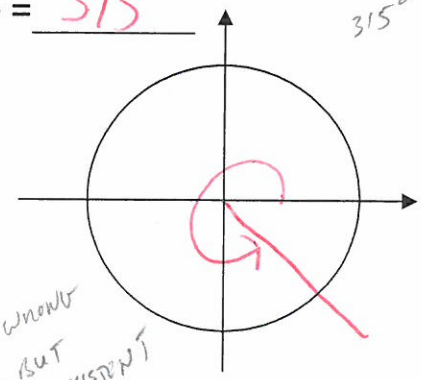
Math 112 / Coleman / Test 1 / F 2013 / Name KEY

Show all necessary work for full or partial credit, neatly and in **pencil only**. Use correct notation. The test is worth 100 points but there are 110 points available.

1. 32pts Fill in the missing parts – blanks for parts a) thru d) – using exact values in the form of simplified radicals, fractions, or whole numbers not decimals.

- When necessary: write the angle measure, θ, in **both degree and radian** using only the **standard angles** in the interval $[0^\circ, 360^\circ)$ and $[0, 2\pi)$;
- Identify the reference angle, $\bar{\theta}$, in degrees, note $0^0 < \bar{\theta} < 90^0$;
- **Draw the standard angle**, θ, **in standard position** using the "indicator" curve with an arrow, see b);
- Label the ordered pair representing the point of intersection with the angle and the given unit circles (like part b).

a) (8 pts) $\theta = \frac{7\pi}{4} =$ 315° ← -2 IF NOT 315°

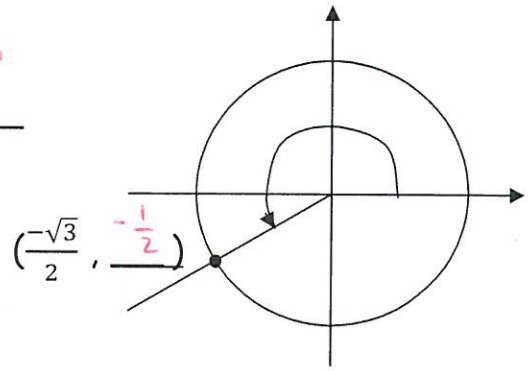


$\bar{\theta} =$ 45°

$\left(\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$ ← IF WRONG -3 BUT CONSISTENT

$\sin\theta =$ $-\frac{\sqrt{2}}{2}$ $\cos\theta =$ $\frac{\sqrt{2}}{2}$ $\tan\theta =$ -1

b) (7 pts) $\theta =$ 210° $=$ $\frac{7\pi}{6}$



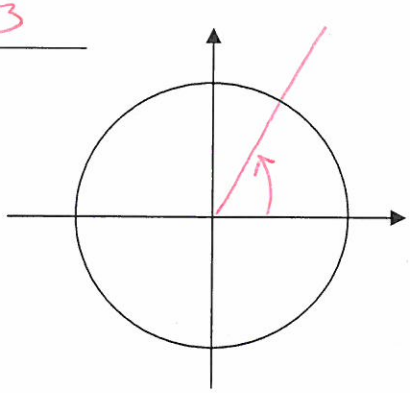
$\bar{\theta} =$ 30°

$\left(\frac{-\sqrt{3}}{2}, -\frac{1}{2}\right)$

$\sin\theta =$ $-\frac{1}{2}$ $\cos\theta =$ $\frac{-\sqrt{3}}{2}$ $\tan\theta =$ $\frac{1}{\sqrt{3}}$

c) (9 pts) $\theta_c = -300^\circ$ is coterminal with which standard angle? Draw the standard angle.

$\theta =$ 60° $=$ $\frac{\pi}{3}$

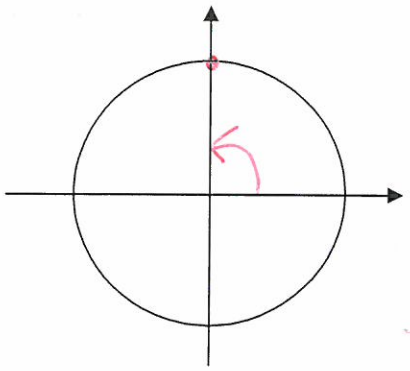


$\bar{\theta} =$ 60°

$\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

$\sin\theta =$ $\frac{\sqrt{3}}{2}$ $\cos\theta =$ $\frac{1}{2}$ $\tan\theta =$ $\sqrt{3}$

d) (8 pts) $\theta =$ 90° $=$ $\frac{\pi}{2}$



$\bar{\theta} =$ N.A.

$(0, 1)$

$\sin\theta = 1$ $\cos\theta =$ 0 $\tan\theta =$ UNDEF

-1 IF ≥ 2 DEG SYM MISS

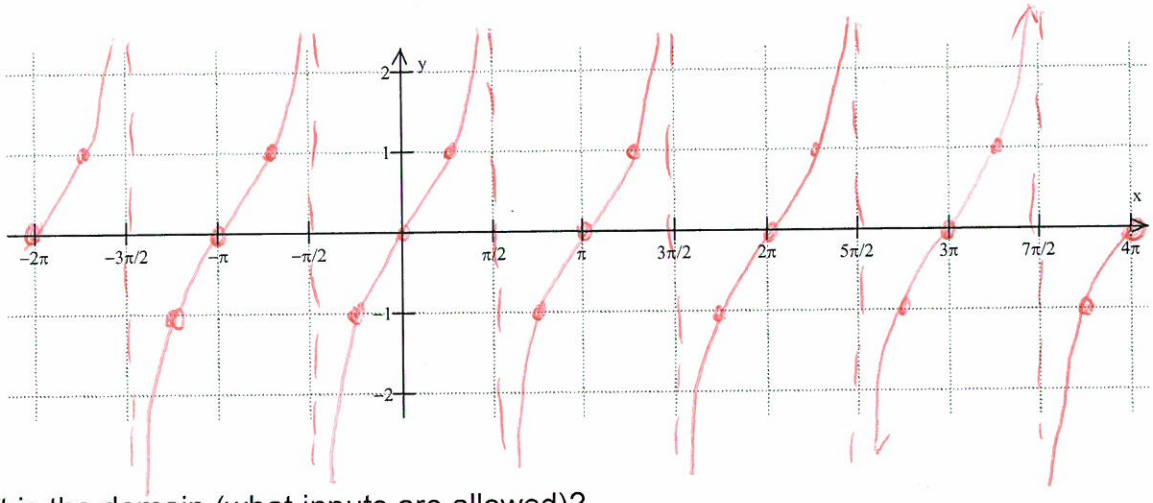
2. 16pts **Which of the three main trig functions, sine, cosine, tangent, has a graph with asymptotes?**

+2 tangent

Sketch the graph of the function you chose. Make sure that any zeros, maximums, minimums, or other key points, and asymptotes are correctly placed. −8 FOR OTHER GRAPH

Sketch its graph all the way from the left to the right. Use radians.

+4



−2 IF $(\frac{\pi}{4}, 1)$ NOT IN CORRECT PLACE

What is the domain (what inputs are allowed)?

+4 $\{x \mid x \neq \frac{\pi}{2} + n\pi, n \in \mathbb{Z}\}$

What is the range (what outputs can be expected)?

+4 $y \in \mathbb{R}$

+2 What is the period of the function (how long before it repeats)? π

3. 12 pts **Given the shaded area of the sector enclosed by a central angle of 140° is 16 in.^{2}, find the radius of the circle and the arc length *S* that subtends the angle. Use appropriate units and round to two decimals - hundredths.** HINT $S = r\theta$ & $A = (\frac{1}{2})\theta r^2$

A

$\theta = 140°(\frac{\pi}{180°})$

$\theta = \frac{7\pi}{9}$

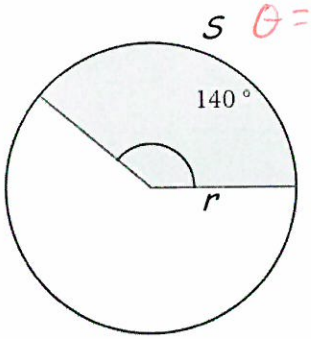
$16 = \frac{7\pi}{18} r^2$

$\frac{16 \cdot 18}{7\pi} = r^2$

$r = \sqrt{\frac{16 \cdot 18}{(7\pi)}}$

NOTE $r = \sqrt{\frac{16 \cdot 18\pi}{7}} \approx 11.37$ −2

$S = r(\frac{7\pi}{9})$



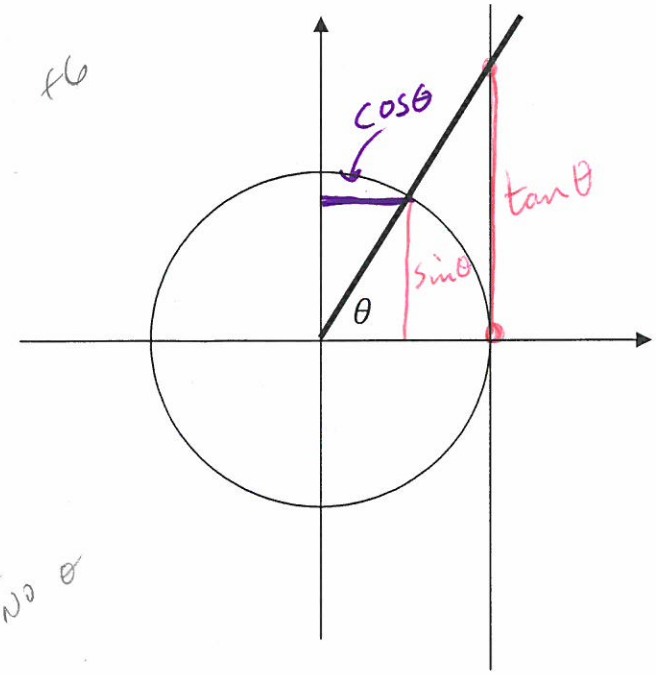
+6 +6 OK IF 27.78 in

r = 3.62 in. 0.48 in 6.72 in S = 8.84 in.

+1 +1 −8 +1 +1

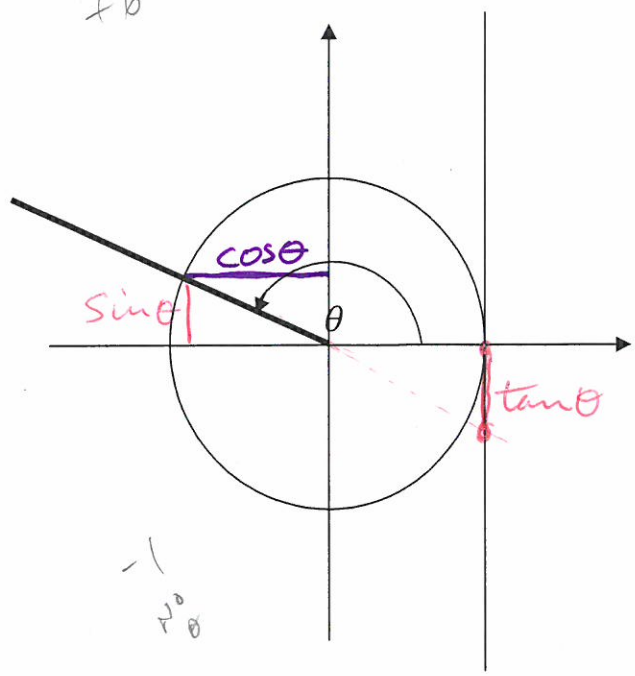
4. 12 pts Draw and label the line segments that represent $\sin(\theta)$, $\cos(\theta)$, and $\tan(\theta)$ in the pictures of the unit circle below:

+6



-1 IF NO θ

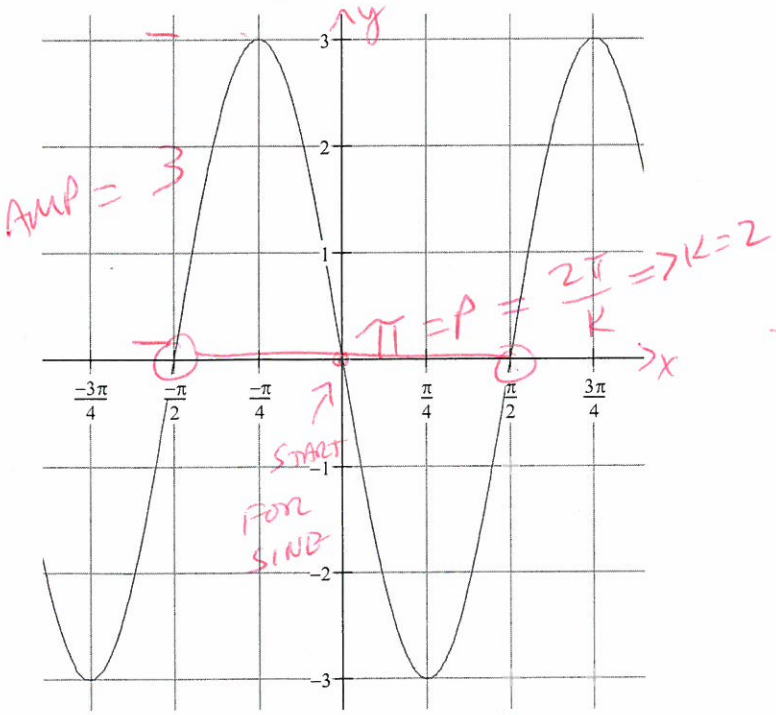
+6

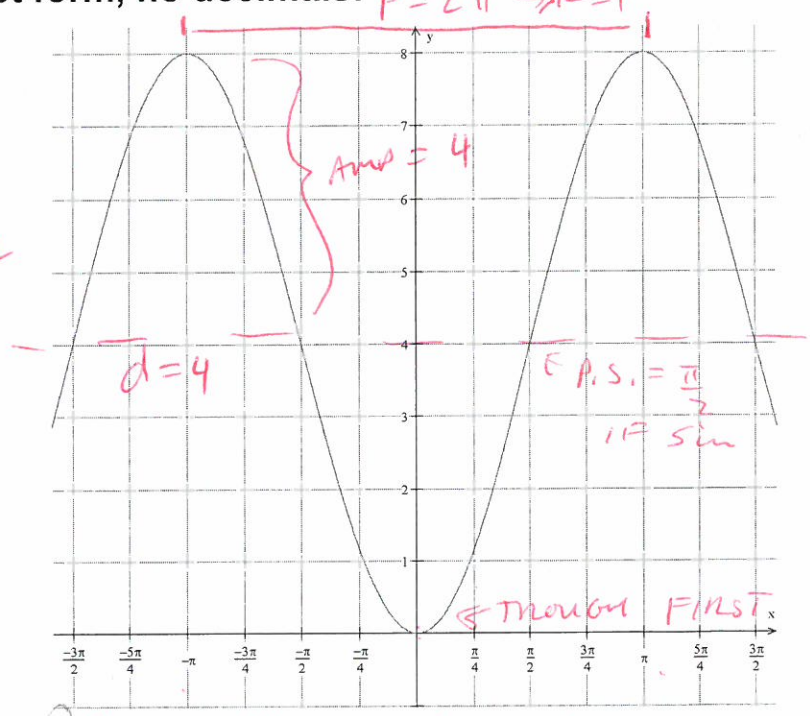


-1 NO θ

5. 12pts Give a possible equation for each graph, you may use your calculator as a check. The parameters must be in exact form, no decimals:

$P = 2\pi \Rightarrow K = 1$





$y = -3\sin(2x)$ +6

or

$y = 3\sin(2(x + \frac{\pi}{2}))$

or $y = 3\cos(2(x + \frac{\pi}{4}))$

-2 IF NO y =

+6 $y = -4\cos(x) + 4$

or

$y = 4\sin(x - \frac{\pi}{2}) + 4$

or

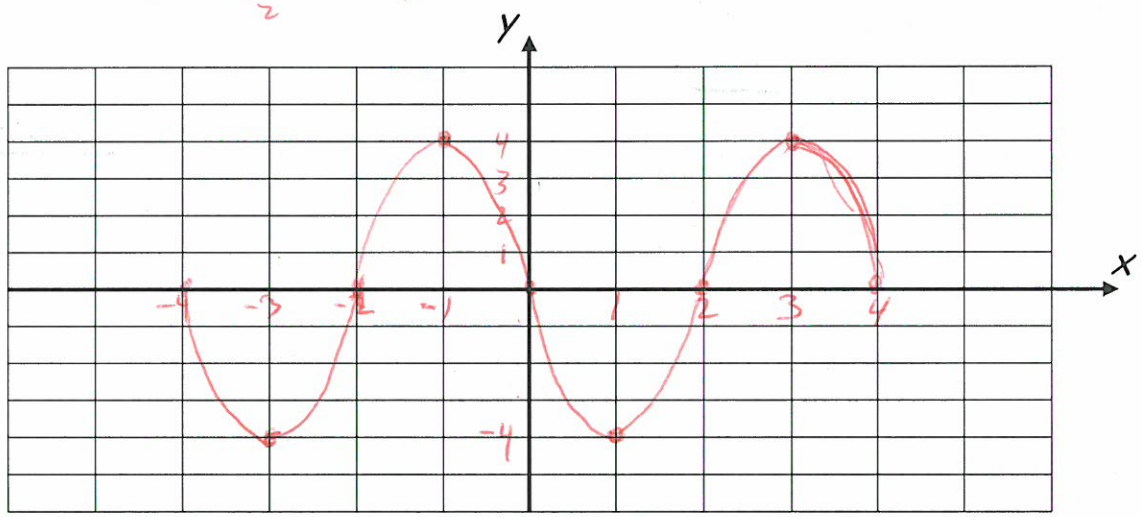
$y = 4\cos(x \pm \pi) + 4$

6. 16pts **For the given functions:** Sketch each graph, showing at least two full cycles, **clearly labeling the scale on the *x* and *y* axes** and **clearly plot the 5 key points**. Identify the amplitude, period and phase shift. Use radians, not degrees.

a) $y = -4\sin\left(\frac{\pi}{2}x\right)$ 5K

$P = \frac{2\pi}{\frac{\pi}{2}} = 4$

+8



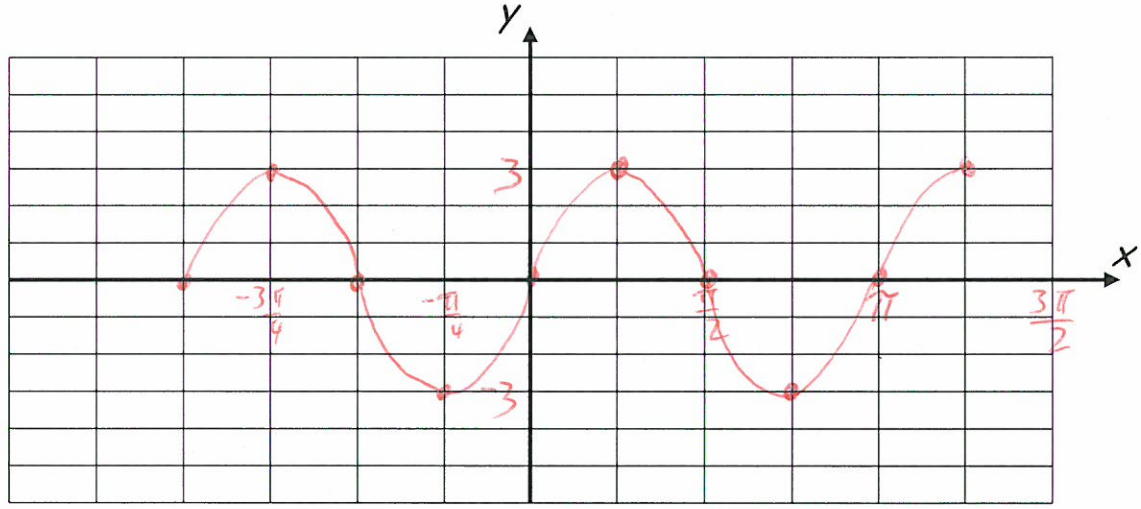
amplitude= 4

period= 4

phase shift= 0

b) $y = 3\cos\left(2\left(x - \frac{\pi}{4}\right)\right)$

+8



amplitude= 3

period= π

phase shift= $\frac{\pi}{4}$

7. 10pts

a) What is $\frac{\pi}{5}$ in degrees?

$\frac{\pi}{5} \cdot \frac{180^\circ}{\pi} = 36^\circ$

$\frac{\pi}{5} =$ 36°

b) Write 75° in radians as a fraction multiple of π.

$75^\circ \cdot \frac{\pi}{180^\circ} = \frac{15\pi}{36} = \frac{5\pi}{12}$

$75^\circ =$ $\frac{5\pi}{12}$