

*INSTRUCTIONS: Solve each problem in the space provided. You must show any and all work for credit. Partial credit will be given based upon how you approached each problem. Leave answers in exact, simplified form. Circle your final answer for each problem.*

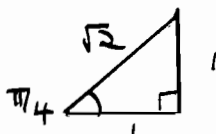
- 6 1. Convert  $-320^\circ$  to radians. Give an exact, simplified answer in terms of  $\pi$ .

$$-320^\circ \left( \frac{\pi}{180^\circ} \right) = \boxed{-\frac{16\pi}{9}}$$

- 6 2. Find  $\sec\left(\frac{3\pi}{4}\right)$  using a reference angle. Leave your answer in exact form.

$$\hat{\theta} = \frac{\pi}{4}, \theta \in QII$$

$$\sec\left(\frac{3\pi}{4}\right) = -\sec\left(\frac{\pi}{4}\right) = \boxed{-\sqrt{2}}$$



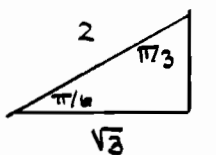
- 6 3. Find the exact value of  $\cos^{-1}\left(-\frac{1}{2}\right)$  in radians.

$$\cos^{-1}\left(-\frac{1}{2}\right) = \theta$$

$$\cos \theta = -\frac{1}{2}, 0 \leq \theta \leq \pi$$

$$\hat{\theta} = \frac{\pi}{3}, \theta \in QII$$

$$\theta = \pi - \frac{\pi}{3} = \boxed{\frac{2\pi}{3}}$$



- 3 4. State the range for each inverse function in terms of radians.

(a)  $y = \sin^{-1}x$

$$\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$$

(b)  $y = \cos^{-1}x$

$$[0, \pi]$$

(c)  $y = \tan^{-1}x$

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

6 5. Use negative angle identities to simplify  $\sin \theta \cos(-\theta) - \cos \theta \sin(-\theta)$ .

$$= \sin \theta \cos \theta - \cos \theta (-\sin \theta)$$

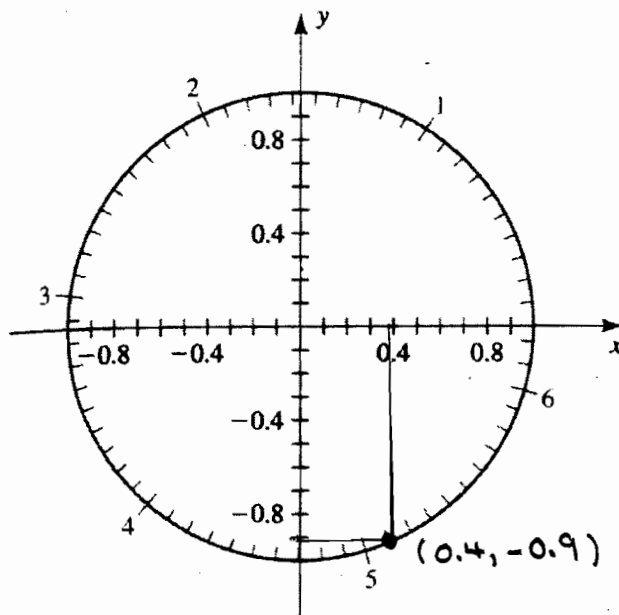
$$= \sin \theta \cos \theta + \sin \theta \cos \theta$$

$$= \boxed{2 \sin \theta \cos \theta}$$

6 6. Use the unit circle given below to estimate  $\cos(5.1)$  and  $\csc(5.1)$ .

$$\cos(5.1) \approx \boxed{0.4}$$

$$\csc(5.1) \approx \boxed{-\frac{1}{0.9}} \approx -1.1$$

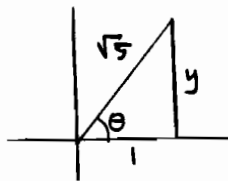


6 7. Simplify  $\sin\left(\cos^{-1}\frac{1}{\sqrt{5}}\right)$  and write your answer in *exact* form.

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

$$\cos \theta = \frac{1}{\sqrt{5}}, \quad 0 \leq \theta \leq \pi$$

$$\sin \theta = \boxed{\frac{2}{\sqrt{5}}}$$



$$1^2 + y^2 = (\sqrt{5})^2$$

$$1 + y^2 = 5$$

$$y^2 = 4$$

$$y = 2$$

For Problems 8-10, identify the amplitude (if defined), period, and horizontal shift. Then graph each function **carefully** on the grid provided. Show at least one complete cycle and label the coordinates of the endpoints of the cycle. Label the axes so that the scale is clear.

10 8.  $y = -3\cos(\pi x)$

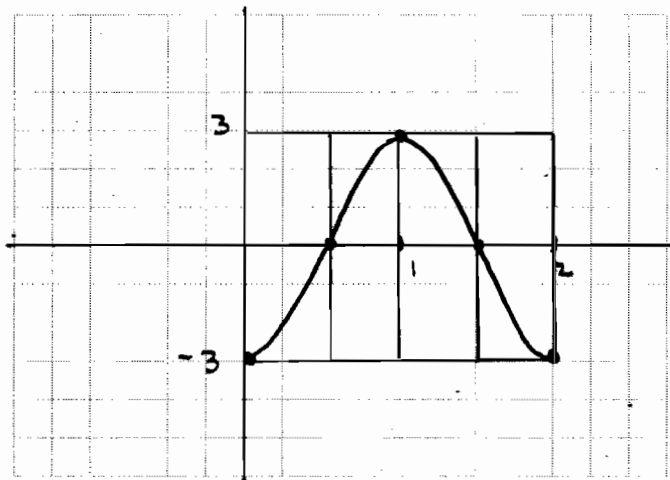
AMP =  $\boxed{3}$

PERIOD =  $\frac{2\pi}{\pi} = \boxed{2}$

NO HORIZ SHIFT

$0 \leq \pi x \leq 2\pi$

$0 \leq x \leq 2$



10 9.  $y = -2 + \sin\left(\frac{1}{2}x + \frac{\pi}{4}\right)$

AMP =  $\boxed{1}$

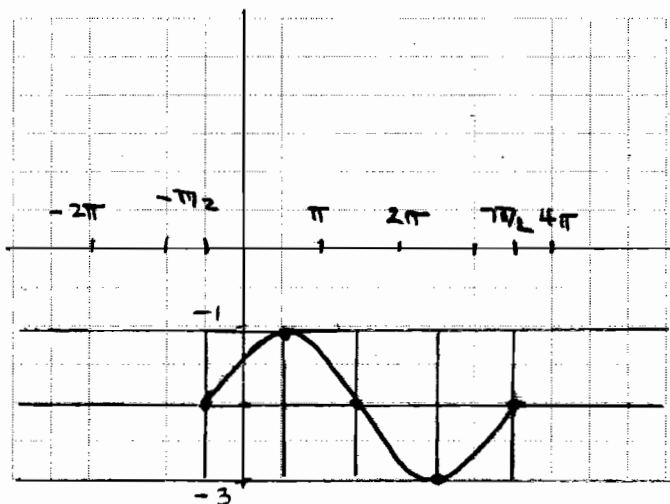
PERIOD =  $\frac{2\pi}{1/2} = \boxed{4\pi}$

HORIZ SHIFT =  $\boxed{-\pi/2}$

$0 \leq \frac{1}{2}x + \frac{\pi}{4} \leq 2\pi$

$-\frac{\pi}{4} \leq \frac{1}{2}x \leq \frac{7\pi}{4}$

$-\frac{\pi}{2} \leq x \leq \frac{7\pi}{2}$



10 10.  $y = 1 + \frac{1}{2}\csc\left(x - \frac{\pi}{4}\right)$

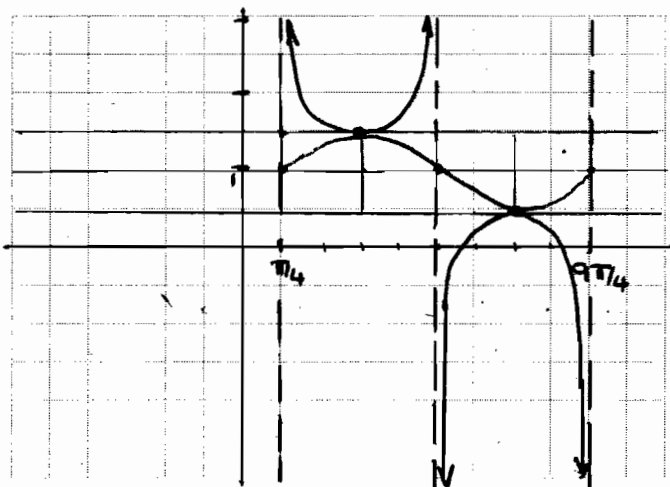
NO AMP

PERIOD =  $\boxed{2\pi}$

HORIZ SHIFT =  $\boxed{\pi/4}$

$0 \leq x - \frac{\pi}{4} \leq 2\pi$

$\frac{\pi}{4} \leq x \leq \frac{9\pi}{4}$



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5 11. Convert 1.6 radians to degrees. Approximate to the nearest tenth of a degree.

$$\approx \boxed{91.7^\circ}$$

4 12. State the reference angle for each of the following:

2 (a)  $280^\circ$

$$\hat{\theta} = 360^\circ - 280^\circ \\ = \boxed{80^\circ}$$

2 (b)  $-\frac{7\pi}{6} = -7 \cdot \frac{\pi}{6}$

$$\hat{\theta} = \boxed{\frac{\pi}{6}}$$

6 13. Use your calculator to find the angle  $\theta$  ( $0^\circ \leq \theta < 360^\circ$ ) to the nearest tenth of a degree if  $\sin \theta = -0.0390$  and  $\theta \in \text{QIII}$ . Show enough work so that I understand how you arrived at your answer.

$$\hat{\theta} = \sin^{-1}(.0390) \\ \approx 2.2^\circ$$

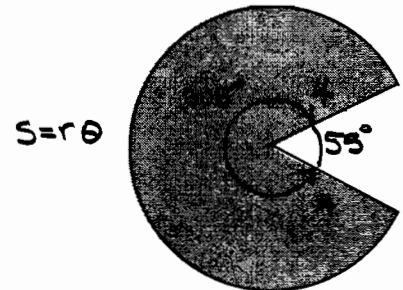
$$\theta = 180^\circ + 2.2^\circ \\ = \boxed{182.2^\circ}$$

8 14. Shown below is an image of Pac-Man from the classic video game. The "mouth" of Pac-Man forms a central angle of  $55^\circ$  in a circle with radius 4 mm. Round your answers to one decimal place, and make sure you include the proper units.

4 (a) Find the length of the perimeter of Pac-Man (including the sides of the mouth)

$$360^\circ - 55^\circ = 305^\circ \approx 5.3 \text{ RADIANS}$$

$$P = 4(5.3) + 4 + 4 = \boxed{29.2 \text{ mm}}$$

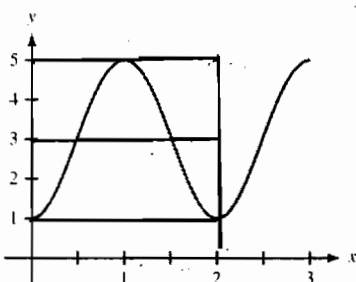


4 (b) Find the area enclosed by Pac-Man

$$A = \frac{1}{2}(4)^2(5.3)$$

$$\approx \boxed{42.4 \text{ mm}^2}$$

8 15. Find a trigonometric model (equation) to match the graph shown.



PERIOD = 2

$$\frac{2\pi}{B} = 2$$

$$B = \pi$$

AMP = 2

$$K = 3$$

USE REFLECTED COSINE

$$\boxed{y = 3 - 2 \cos(\pi x)}$$