

Name: _____

Score: _____

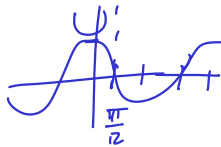
- Please show all work in the space provided for each problem and **circle your final answer** when appropriate. **No credit may be awarded if no work is shown.**
- Make sure your calculator is in the appropriate **MODE** if you are using it for a problem.
- **No credit will be given for a decimal approximation in a problem which asks for an exact answer.**

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Problem 1. [12 points] For each of the following circle **True** or **False**. No partial credit will be given on these questions.

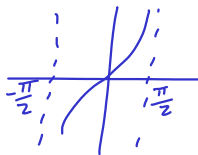
- (a) The vertical asymptotes for $y = \sec x$ are $x = n\pi$ where n is any integer. True

False



- (b) The domain of $y = \tan x$ is $x \neq \frac{2n+1}{2}\pi$ where n is any integer. True

False



- (c) If $\sec \theta > 0$ and $\tan \theta < 0$, then θ is in Quadrant II.

True

False

Q 1, 4

Q 2, 4

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

True

False

Problem 2. [12 points] A watch is sitting on the edge of a rotating circular display case with an 18 inch diameter which makes 1 revolution every 14 seconds. Find the **angular speed** and **linear speed** of the watch. Round your answers to 2 decimal places, and be sure to include units.

$$\frac{1 \text{ rev}}{14 \text{ sec}} = \frac{2\pi \text{ rad}}{14 \text{ sec}} = \frac{\pi}{7} \text{ rad/sec}$$

Angular speed: 0.45 rad/sec

Linear speed: 4.04 in/sec

$$\frac{\pi}{7} \cdot 9 = 4.04 \text{ in/sec}$$

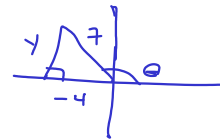
Problem 3. [9 points] Given $\sec \theta = -\frac{7}{4}$ and $\tan \theta < 0$, find the exact values of each of the following.

(a) $\sin \theta$

$$\frac{\sqrt{33}}{7}$$

$$\cos \theta = \frac{-4}{7}$$

Q 2 or 4



$$y^2 + 16 = 49$$

$$y = \sqrt{33}$$

(b) $\tan \theta$

$$\frac{-\sqrt{33}}{4}$$

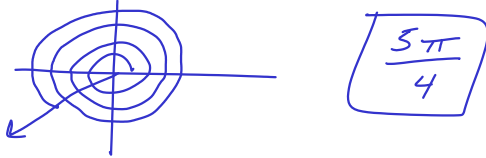
(c) $\sec\left(\frac{\pi}{2} - \theta\right) = \csc \theta = \frac{1}{\sin \theta} = \frac{7}{\sqrt{33}}$

Problem 4. [4 points] What is 27° in radians? Your answer should be an exact value in lowest terms.

$$27^\circ \cdot \frac{\pi}{180^\circ} = \frac{3\pi}{20}$$

Problem 5. [12 points] Answer the following for $\theta = \frac{29\pi}{4}$.

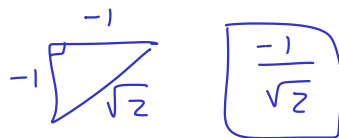
(a) Find an angle between 0 and 2π that is coterminal with θ .



(b) What is the reference angle for θ ?

$$\frac{\pi}{4}$$

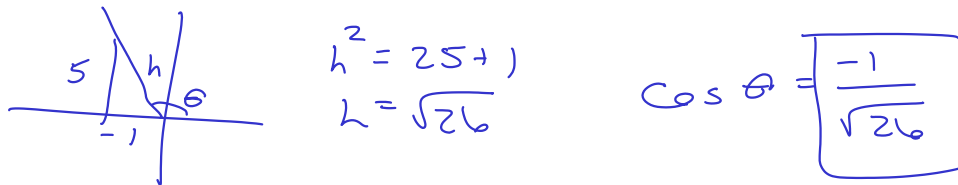
(c) Find $\sin \theta$.



(d) Find $\cos \theta$.

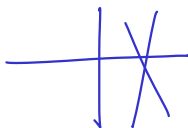
$$\frac{-1}{\sqrt{2}}$$

Problem 6. [4 points] If the point $(-1, 5)$ is on the terminal side of the angle θ , what is the exact value of $\cos \theta$?

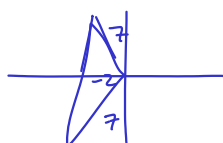


Problem 7. [8 points] Answer the following for $\cos \theta = -\frac{2}{7}$

(a) What quadrants could θ be in? 2 or 3



(b) What are the possible values of $\sin \theta$?

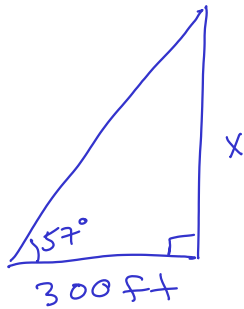


$$y^2 + 4 = 49$$

$$y = \pm \sqrt{45}$$

$$\sin \theta = \pm \frac{\sqrt{45}}{7}$$

Problem 8. [8 points] You are walking around downtown Chicago and notice a very tall building with a lightning rod in the center of its roof. A passerby tells you you are exactly 300 feet from the center of the building. Another passerby tells you that from where you stand, the angle of elevation to the top of the lightning rod is exactly 57° . (Apparently Chicagoans really love to memorize measurements and share them with people on the street.) What is the height of the building, including the lightning rod? Round your answer to the nearest foot. (Note: You must show all work, including an diagram of the problem, to receive full credit.)



$$\tan 57^\circ = \frac{x}{300}$$

$$x = 462 \text{ ft.}$$

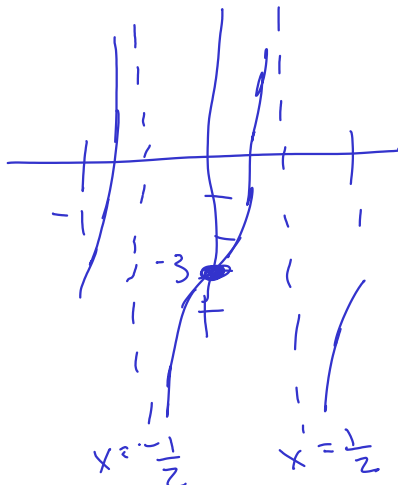
Problem 9. [3+3+6=12 points] Answer the following for

$$f(x) = \frac{1}{2} \tan(\pi x) + 3$$

(a) What is the period of $f(x)$? $\frac{\pi}{\pi} = 1$

(b) What is the range of $f(x)$? $(-\infty, \infty)$

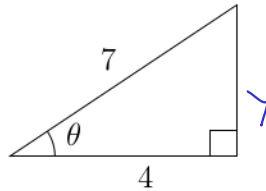
(c) Sketch a graph of $f(x)$. You do not need to plot points, but label the y -intercept (if there is one) and include 2 vertical asymptotes labeled with their equations.



Problem 10. [4 points] Use the right triangle drawn below to find the **exact value** of $\cot \theta$.

$$y^2 + 16 = 49$$

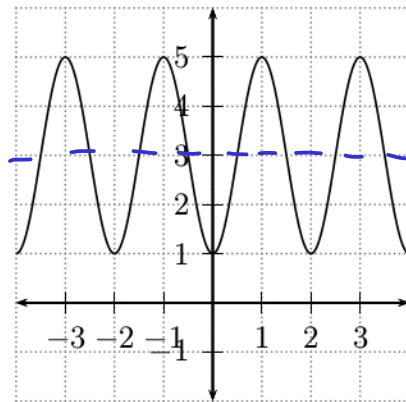
$$y = \sqrt{33}$$



$$\frac{x}{y} = \boxed{\frac{4}{\sqrt{33}}}$$

Problem 11. [15 points] Below is the graph of a function of the form

$$f(x) = d + a \cos(bx - c)$$



Determine the following.

(a) What is the amplitude of $f(x)$? $\frac{4}{2} = \boxed{2}$

(b) What is the period of $f(x)$? 2

(c) $a = -2$

(d) $b = \pi$ $per = 2 = \frac{2\pi}{b}$

(e) $c = 0$

(f) $d = 3$