

PRECALCULUS PROBLEM SESSION #9

Trigonometric Functions and the Unit Circle

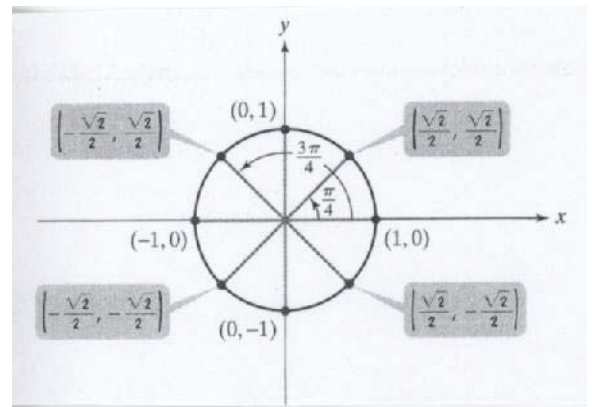
- Which of the six trigonometric functions have vertical asymptotes? Explain why.
- Classify each of the six trig functions as even, odd or neither.
- Use the Pythagorean identity $\sin^2 t + \cos^2 t = 1$ to find $\cos t$: $\sin t = \frac{7}{8}$
- Use an identity to find the value of each expression. Do not use a calculator.

a. $\sin^2 \frac{\pi}{3} + \cos^2 \frac{\pi}{3}$ b. $\csc^2 \frac{\pi}{6} - \cot^2 \frac{\pi}{6}$

- Find the exact value of each trigonometric function. Do not use a calculator.

a. $\csc \frac{9\pi}{4}$ b. $\sec \left(-\frac{9\pi}{4}\right)$ c. $\cot \frac{5\pi}{4}$ d. $-\cot \left(\frac{\pi}{4} + 17\pi\right)$

- The unit circle has been divided into eight equal arcs, corresponding to t -values of $0, \frac{\pi}{4}, \frac{\pi}{2}, \frac{3\pi}{4}, \pi, \frac{5\pi}{4}, \frac{3\pi}{2}, \frac{7\pi}{4}, 2\pi$. Use the (x,y) coordinates in the figure to find the value of each trigonometric function and (b) use periodic properties and your answer from part (a) to find the value the same trigonometric function at the indicated real number.



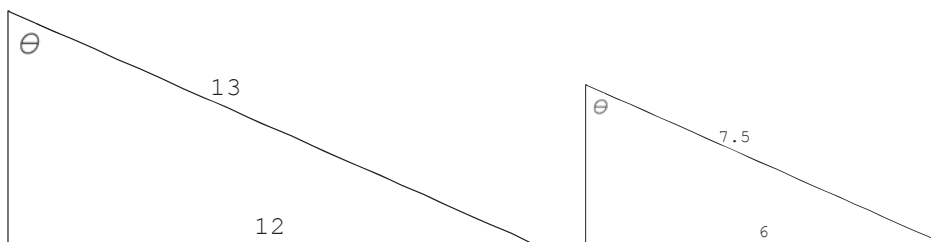
(a)
of

a. $\cos \frac{11\pi}{4}$ b. $\cot \frac{15\pi}{2}$

- Explain when, if ever, the values of the other 5 trigonometric functions of angle A can be determined if only the value of $\tan A$ is known.

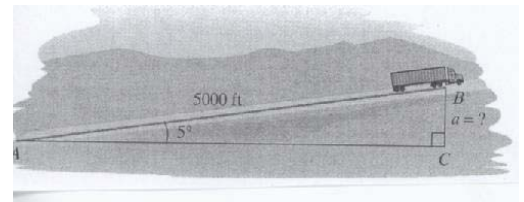
Right Triangle Trigonometry

- Find the exact values of the six trigonometric functions of the angle θ for the two triangles below, and explain why the function values are the same.



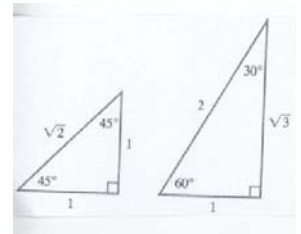
- A ramp for wheelchair accessibility is to be constructed with an angle of elevation of 15° and a final height of 6 feet. How long will the ramp be?

3. A road is inclined at an angle of 5° . After driving 5000 feet along this road, find the driver's increase in altitude. Round to the nearest foot. (Figure 1)



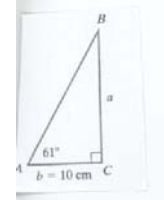
4. Use the given triangles to evaluate each expression. If necessary, express the value without a square root in the denominator by rationalizing the denominator.

a. $\tan 30^\circ$ b. $\csc 45^\circ$ c. $\cot \frac{\pi}{3}$



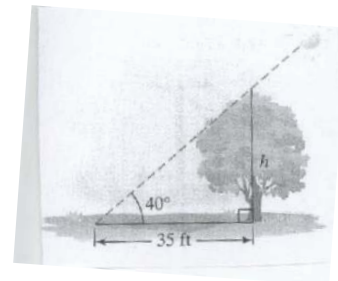
5. Find a cofunction with the same value as $\sin 19^\circ$

6. Find the measure of the side of the right triangle whose length is designated by a letter. Round answers to the nearest whole number.



lowercase

7. At a certain time of day, the angle of elevation of the sun is 40° . To the foot, find the height of a tree whose shadow is 35 feet long. (Figure 2)



nearest

Trigonometric Functions of Any Angle

- A point on the terminal side of angle θ is given. Find the exact value of each of the six trigonometric function of θ .
 - $(-12, 5)$
 - $(-1, -3)$
- Evaluate the trigonometric function at the quadrantal angle, or state that the expression is undefined.
 - $\cos \frac{3\pi}{2}$
 - $\tan \frac{\pi}{2}$
- Let θ be an angle in standard position. Name the quadrant in which θ lies: $\tan \theta < 0, \sin \theta < 0$.
- Find the exact value of each of the remaining trigonometric functions of θ .
 - $\sin \theta = -\frac{12}{13}, \theta$ in quadrant III
 - $\tan \theta = -\frac{1}{3}, \sin \theta > 0$
- Find the reference angle for each angle:
 - 170°
 - $\frac{5\pi}{4}$
- Use reference angles to find the exact value of each expression. Do not use a calculator.
 - $\sin 300^\circ$
 - $\cos \frac{3\pi}{4}$
 - $\cot \frac{7\pi}{4}$
 - $\tan \frac{9\pi}{2}$