

MA 15400

Spring 2012

Exam 1

Solutions

PYTHAGOREAN IDENTITIES

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$1 + \tan^2 \theta = \sec^2 \theta$$

$$1 + \cot^2 \theta = \csc^2 \theta$$

Lessons 1-9, Covering Sections 6.1, 6.2, 6.3, and all of 6.4

1. Approximate
- $\csc(73.4^\circ)$
- to four decimal places.

$$\frac{1}{\sin 73.4^\circ} = \frac{1}{0.9583} = 1.0435$$

A. 3.5003

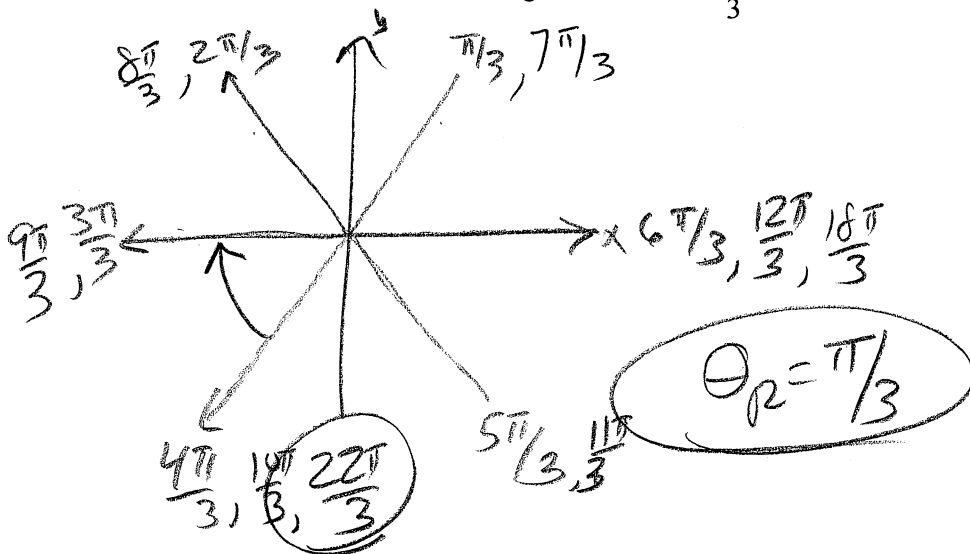
B. 1.0329

C. 1.0435

D. 3.9939

E. None of the above

2. Find the reference angle,
- θ_R
- , for
- $\theta = \frac{22\pi}{3}$

A. $\frac{2\pi}{3}$ B. $-\frac{\pi}{6}$ C. $-\frac{\pi}{3}$ D. $\frac{\pi}{6}$

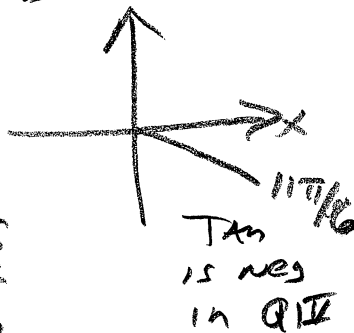
E. None of the above

3. Find the exact value of
- $\tan\left(\frac{11\pi}{6}\right)$
- .

$$\tan\left(\frac{11\pi}{6}\right) = -\frac{1}{\sqrt{3}} \text{ or } -\frac{\sqrt{3}}{3}$$

$$\theta_R = \frac{\pi}{6}$$

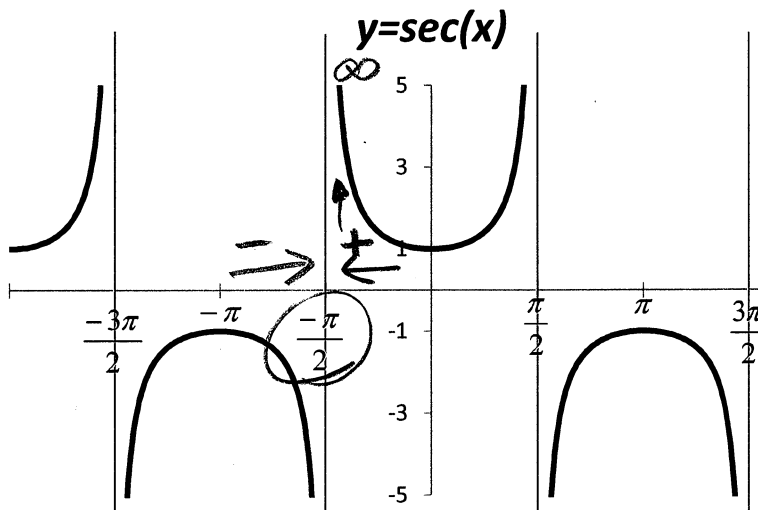
$$\tan \frac{\pi}{6} = \frac{1}{\sqrt{3}} \text{ or } \frac{\sqrt{3}}{3}$$

A. $\sqrt{3}$ B. $-\frac{1}{\sqrt{3}}$ C. $-\sqrt{3}$ D. $\frac{1}{\sqrt{3}}$

E. None of the above

4. Given the graph of $y = \sec(x)$, complete the following statement.

As $x \rightarrow \frac{-\pi}{2}^+$, $\sec(x) \rightarrow \infty$

A. $-\infty$

B. 0

C. 1

D. ∞

E. None of the above

5. Express the angle $\theta = 4.9$ in terms of Degrees, Minutes and Seconds, to the nearest second.

$$\left(\frac{4.9}{1}\right)\left(\frac{180^\circ}{\pi}\right) = 280.7493^\circ$$

A. $280^\circ 45' 57''$ B. $269^\circ 18' 24''$ C. $280^\circ 44' 58''$ D. $269^\circ 17' 25''$

E. None of the above

$$0.7493^\circ$$

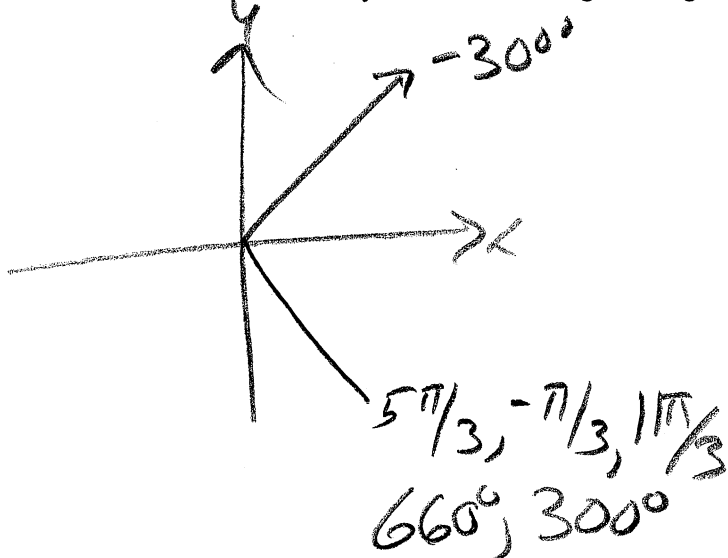
$$\begin{array}{r} \times 60'' \\ \hline 44.9592' \end{array}$$

$$\begin{array}{r} 0.9592' \\ \times 60'' \\ \hline 57.5506'' \end{array}$$

$$280^\circ 44' 58''$$

6. Which of the following is **not** a coterminal angle with $\theta = \frac{5\pi}{3}$?

Answer E if you feel all of the given angles are coterminal with θ .



A. $-\frac{\pi}{3}$

B. -300°

C. $\frac{11\pi}{3}$

D. $660^\circ - 360 = 300^\circ$

E. All of the above are coterminal with θ

7. Which angle is **complementary** with $\theta = 25^\circ 34' 6''$?

$$\begin{array}{r} 89^\circ 59' 60'' \\ - 25^\circ 34' 6'' \\ \hline 64^\circ 25' 54'' \end{array}$$

A. $\theta = 64^\circ 25' 54''$

B. $\theta = 155^\circ 26' 54''$

C. $\theta = 154^\circ 25' 54''$

D. $\theta = 65^\circ 26' 54''$

E. None of the above

8. Find the area of the sector of a circle with a central angle θ that subtends an arc length 22.2 cm on a circle with a radius of 11.1 cm. Round your answer to the nearest tenth.

$$\begin{aligned} S &= r\theta \\ 22.2 &= 11.1\theta \\ \theta &= \frac{22.2}{11.1} \\ \theta &= 2 \end{aligned}$$

$$\begin{aligned} A &= \frac{1}{2}r^2\theta \\ A &= \frac{1}{2}(11.1)^2(2) \\ &= 123.2 \text{ cm}^2 \end{aligned}$$

A. 131.7 cm^2

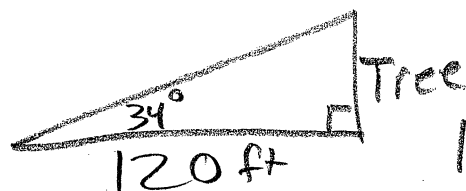
B. 171.6 cm^2

C. 180.1 cm^2

D. 123.2 cm^2

E. None of the above

9. Bill saw a tree on his trip out west. The tree was said to be over 120 years old and was owed by Fred and Wilma Smith of Mitchell South Dakota. Bill talked to Fred; however, Wilma was rude and did not engage in conversation. From a distance of 120 feet from the center of the tree, Bill measured the angle between the ground and the top of the tree to be 34° . To the nearest foot, how tall is the tree?



$$\tan 34^\circ = \frac{\text{Tree}}{120}$$

$$120 \tan 34^\circ = \text{Tree}$$

$$\text{Tree} = 80.94$$

$$= 81 \text{ ft}$$

A. 81 ft

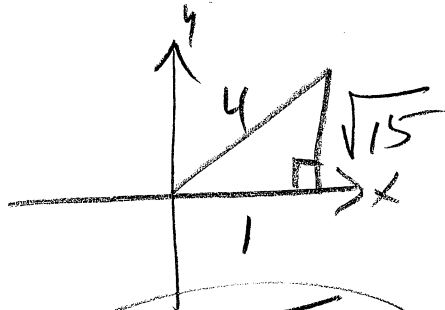
B. 193 ft

C. 178 ft

D. 88 ft

E. None of the above

10. Find the exact value of $\tan \theta$ if $\sec \theta = 4$ and $\sin \theta > 0$.



$$\tan \theta = \frac{\sqrt{15}}{1}$$

QI, II QI, II

QI

A. $\sqrt{35}$ B. $\sqrt{15}$ C. $-\sqrt{35}$ D. $-\sqrt{15}$

E. None of the above

$$\sec \theta = 4$$

$$\cos \theta = \frac{1}{4}$$

$$4^2 = 1^2 + b^2$$

$$b = \sqrt{15}$$

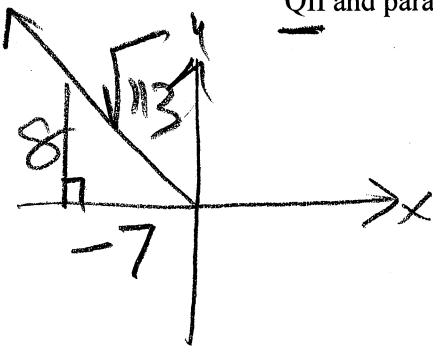
11. Which of the following is equivalent to $\frac{\csc x - \sin x}{\cos x}$?

$$\frac{\frac{1}{\sin x} - \frac{\sin x}{1}}{\cos x} = \frac{\frac{1 - \sin^2 x}{\sin x}}{\cos x}$$

$$= \frac{\cos^2 x}{\sin x \cos x} = \frac{\cos x}{\sin x} = \cot x$$

A. $\sin x$ B. $\tan x$ C. $\sec x$ D. $\cot x$ E. $\cos x$

12. Find the exact value of $\csc \theta$ if θ is in standard position and the terminal side of θ is in QII and parallel to the line $8x + 7y = 7$



$$8^2 + 7^2 = c^2$$

$$c = \sqrt{113}$$

$$7y = -8x + 7$$

$$y = -\frac{8}{7}x + 1$$

$$M = -\frac{8}{7}$$

$$\therefore \tan \theta = -\frac{8}{7}$$

$$\tan \theta = \frac{y}{x} = -\frac{8}{7}$$

A. $\frac{\sqrt{113}}{8}$

B. $\frac{-\sqrt{113}}{7}$

C. $\frac{-\sqrt{113}}{8}$

D. $\frac{\sqrt{113}}{7}$

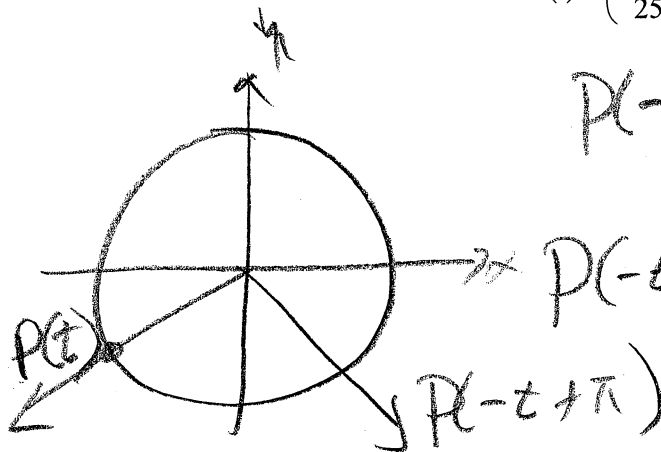
E. None of the above

$$\sin \theta = \frac{8}{\sqrt{113}}$$

$$\csc \theta = \frac{\sqrt{113}}{8}$$

13. Let $P(t)$ be the point that the terminal side of the angle t intersects

the unit circle. If $P(t) = \left(-\frac{24}{25}, \frac{7}{25}\right)$, find $P(-t + \pi)$.



$$P(-t) = \left(\frac{24}{25}, \frac{7}{25}\right)$$

A. $\left(-\frac{24}{25}, \frac{7}{25}\right)$

B. $\left(\frac{-24}{25}, \frac{7}{25}\right)$

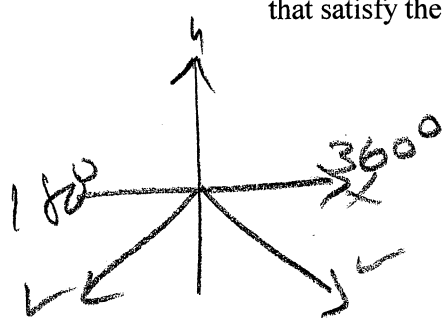
C. $\left(\frac{24}{25}, \frac{-7}{25}\right)$

D. $\left(\frac{24}{25}, \frac{7}{25}\right)$

E. None of the above.

Lessons 1-9, Covering Sections 6.1, 6.2, 6.3, and all of 6.4

14. Approximate to the nearest 0.01°, all angles θ in the interval $[0^\circ, 360^\circ)$ that satisfy the equation $\sin \theta = -0.8739$.



$$\theta = \sin^{-1}(-0.8739)$$

$$\theta = -60.92^\circ$$

$$\theta_R = 60.92^\circ$$

$$\theta_1 = 180^\circ + 60.92^\circ = 240.92^\circ$$

$$\theta_2 = 360^\circ - 60.92^\circ = 299.08^\circ$$

A. $103.12^\circ, 283.12^\circ$

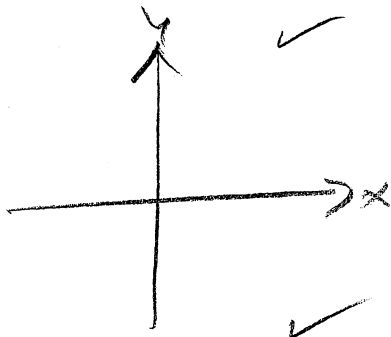
B. $240.92^\circ, 299.08^\circ$

C. $256.88^\circ, 283.12^\circ$

D. $119.08^\circ, 299.08^\circ$

E. None of the above

15. Approximate to the nearest 0.01 radians, all angles θ in the interval $[0, 2\pi)$ that satisfy the equation $\sec \theta = 1.3776$.



$$\cos \theta > 0$$

$$QI, IV$$

$$\frac{1}{\sec \theta} = \frac{1}{1.3776}$$

$$\cos \theta = 0.7259$$

$$\theta = \cos^{-1}(0.7259)$$

$$\theta_1 = 0.7585$$

$$\theta_2 = 0.7585$$

$$\theta_2 = 2\pi - 0.7585$$

$$\theta_2 = 5.5247$$

A. 0.76, 5.52

B. 2.31, 3.97

C. 2.38, 3.87

D. 0.83, 5.46

E. None of the above

| Question | Answer | Letter |
|----------|---|--------|
| 1. | 1.0435 | C |
| 2. | $\frac{\pi}{3}$ | E |
| 3. | $\frac{-1}{\sqrt{3}}$ | B |
| 4. | ∞ | D |
| 5. | 280° 44' 58" | C |
| 6. | -300° | B |
| 7. | $\theta = 64^\circ 25' 54''?$ | A |
| 8. | 123.2 cm^2 | D |
| 9. | 81 ft | A |
| 10. | $\sqrt{15}$ | B |
| 11. | $\cot x$ | D |
| 12. | $\frac{\sqrt{113}}{8}$ | A |
| 13. | $\left(\frac{24}{25}, \frac{-7}{25}\right)$ | C |
| 14. | 240.92°, 299.08° | B |
| 15. | 0.76, 5.52 | A |