MA 15400

Fall 2014

Exam 1

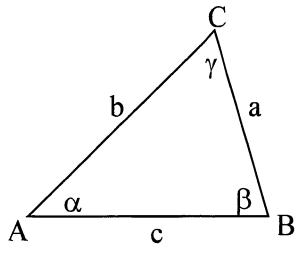
Solutions

PYTHAGOREAN IDENTITIES:

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

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

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



MA 15400 Exam 1 Fall 2014

Covers Lessons 1-11, Sections 6.1, 6.2, 6.3, 6.4, and 6.5

1. Find the angle that is complementary to 48°57'9"

$89^\circ 59' 60''$

$90^\circ\ \ 0'\ \ 0''$

$-\ 48^\circ\ 57'\ 9''$

$41^\circ\ \ 2'\ 51''$

A. 42°3'51"

B. 131°2'51"

C. 41°2'51"

D. 132°3'51"

E. None of the above

2. Express $\theta = 3.5$ in terms of degrees, minutes, and seconds, to the nearest second.

$\left(\frac{3.5}{1}\right)\left(\frac{180^\circ}{\pi}\right) = 200.5352^\circ$

$0.5352^\circ \times 60' = 32.1137'$

$0.1137' \times 60'' = 6.8219''$

$200^\circ\ 32'\ 7''$

A. 200°32'7"

B. 151°15'22"

C. 200°53'52"

D. 151°42'33"

E. None of the above

3. Find the measure of the central angle θ, to nearest 0.1°, subtended by the arc of length $s = 3.5$ feet on a circle of radius $r = 18$ inches. (12 inches = 1 foot)

$s = r\theta$

$3.5\ \text{ft} \times 12\ \text{in/ft} = 42\ \text{in}$

$42 = 18\theta$

$\theta = \frac{42}{18} = 2.\overline{3}$ RADIANS

$\left(\frac{2.\overline{3}}{1}\right)\left(\frac{180^\circ}{\pi}\right) = 133.6902^\circ$

A. 115.9°

B. 127.8°

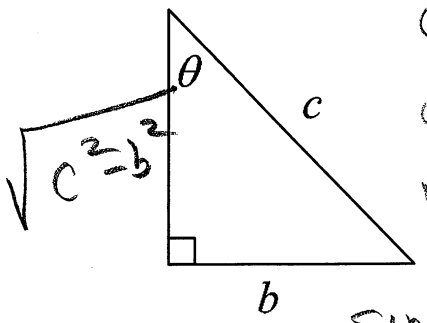
C. 151.5°

D. 133.7°

E. None of the above

Covers Lessons 1-11, Sections 6.1, 6.2, 6.3, 6.4, and 6.5

4. Which **one** of the following statements is true for the given triangle?



$c^2 = b^2 + a^2$

$c^2 - b^2 = a^2$

$\sqrt{c^2-b^2} = a$

A. $\cot\theta = \frac{c}{b}$

B. $\sec\theta = \frac{c}{\sqrt{c^2-b^2}}$

C. $\tan\theta = \frac{\sqrt{c^2-b^2}}{b}$

D. $\cos\theta = \frac{b}{\sqrt{c^2-b^2}}$

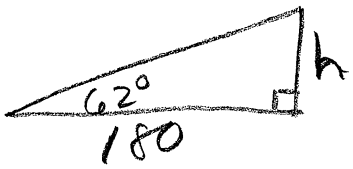
E. $\csc\theta = \frac{b}{c}$

$\sin\theta = \frac{b}{c}$ $\quad \csc\theta = \frac{c}{b}$

$\cos\theta = \frac{\sqrt{c^2-b^2}}{c}$ $\quad \sec\theta = \frac{c}{\sqrt{c^2-b^2}}$

$\tan\theta = \frac{b}{\sqrt{c^2-b^2}}$ $\quad \cot\theta = \frac{\sqrt{c^2-b^2}}{b}$

5. A forester, 180 feet from the base of a redwood tree, observes that the angle between the ground and the top of the tree is 62°. Find the height of the tree to the nearest whole foot.



$\tan 62° = \frac{h}{180}$

$180 \tan 62° = h$

$h = 338.538$

A. 85 feet

B. 159 feet

C. 204 feet

D. 339 feet

E. None of the above

6. Which of the following is equivalent to $(\cot\theta + \csc\theta)(\tan\theta - \sin\theta)$?

$\left(\frac{\cos\theta}{\sin\theta} + \frac{1}{\sin\theta}\right)\left(\frac{\sin\theta}{\cos\theta} - \frac{\sin\theta}{1}\right)$

$1 - \cos\theta + \frac{1}{\cos\theta} - 1$

$-\cos\theta + \sec\theta$

$\sec\theta - \cos\theta$

A. $\sec\theta - \cos\theta$

B. $1 + \tan^2\theta$

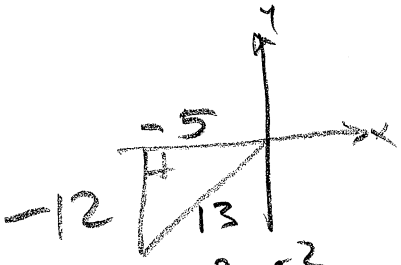
C. $\csc\theta - \sin\theta$

D. $\csc\theta\sec\theta$

E. $1 + \cot^2\theta$

Covers Lessons 1-11, Sections 6.1, 6.2, 6.3, 6.4, and 6.5

7. Find the exact value of $\sin\theta$ if θ is in standard position and the terminal side of θ is in quadrant *III* and parallel to the line $12x-5y=15$



$c^2 = 12^2+5^2$

$c = 13$

$\sin\theta = \frac{y}{h} = \frac{-12}{13}$

Find Slope

Slope = $\tan\theta$

$-5y = -12x + 15$

$y = \frac{12}{5}x - 3$

$m = 12/5$, $\tan\theta = \frac{12}{5}$

$\tan\theta = \frac{y}{x} = \frac{-12}{-5}$

A. $\sin\theta = \frac{5}{13}$

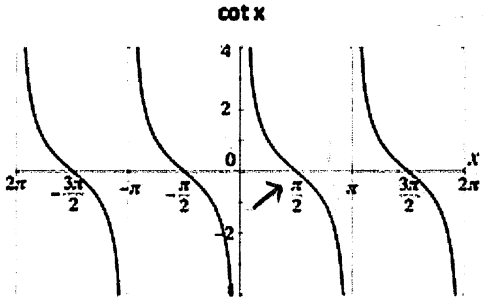
B. $\sin\theta = \frac{-12}{13}$

C. $\sin\theta = \frac{-5}{13}$

D. $\sin\theta = \frac{12}{13}$

E. None of the above

8. Use the graph to complete the statement: As $x \to \frac{\pi}{2}$, $\cot(x) \to$ _____



A. $-\infty$

B. 1

C. 0

D. ∞

E. None of the above

9. In March in Tucson, Arizona, the temperature in degrees Fahrenheit could be described by the equation $T(t) = -11\cos\left(\frac{\pi}{12}t\right) + 57$, where t is in hours and $t = 0$ corresponds to 6 A.M. What is the temperature at 3 P.M.? Angles are in radians and round to a whole number.

Time	t
6 AM	0
9 AM	3
12 PM	6
3 PM	9

$t = 9$

$T(9) = -11\cos\left(\frac{\pi}{12}\cdot 9\right) + 57$

$= 64.7782$

A. 49°

B. 57°

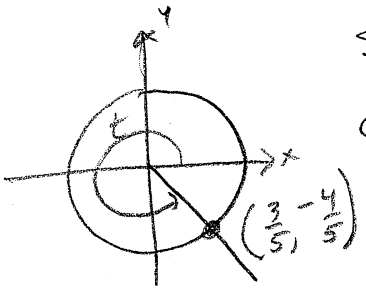
C. 68°

D. 54°

E. 65°

Covers Lessons 1-11, Sections 6.1, 6.2, 6.3, 6.4, and 6.5

10. A point $P\left(\frac{3}{5},\frac{-4}{5}\right)$ is the point of intersection between the terminal side of angle t and the Unit circle. Find the exact value of $\cot(t)$



$\sin t = -4/5$

$\cos t = 3/5$

$\cot t = \frac{\cos t}{\sin t} = \frac{3/5}{-4/5} = -\frac{3}{4}$

A. $\cot(t)=\frac{3}{5}$

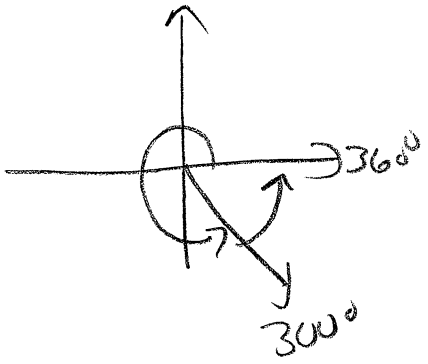
B. $\cot(t)=\frac{-4}{5}$

C. $\cot(t)=\frac{4}{3}$

D. $\cot(t)=\frac{-3}{4}$

E. None of the above

11. Find the reference angle θ_R if $\theta = 300°$



$\theta_R = 360° - 300°$

$= 60°$

A. $\theta_R = 60°$

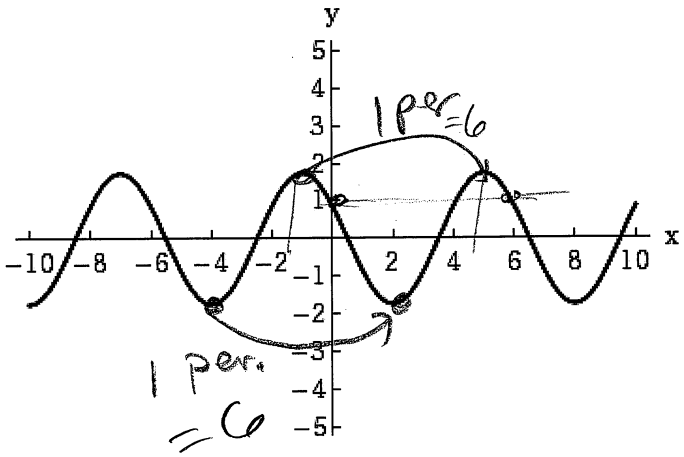
B. $\theta_R = 30°$

C. $\theta_R = 120°$

D. $\theta_R = 45°$

E. None of the above

12. Find the Period of the given graph.



A. Period = 8

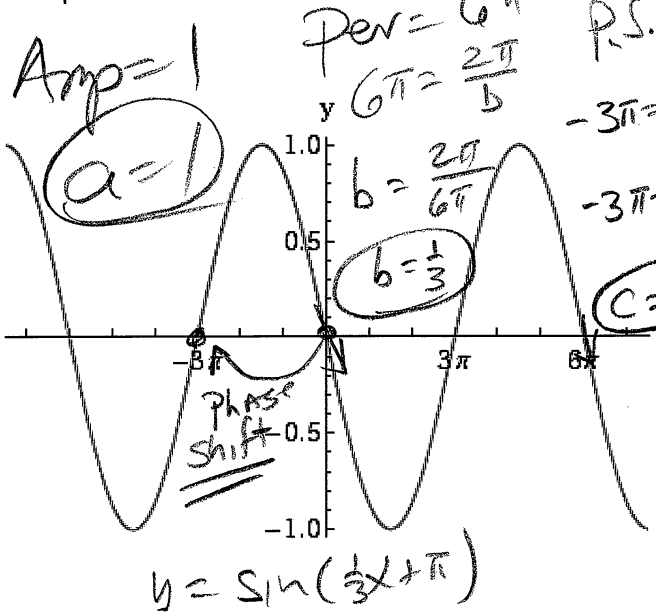
B. Period = 6

C. Period = 4

D. Period = 2

E. Period = ∞

13. Write the equation in the form $y = a\sin(bx + c)$ for $a > 0$, $b > 0$, and the least positive real number c.



$y = \sin\left(\frac{1}{3}x + \pi\right)$

A. $y = \sin\left(\frac{2}{3}x + \pi\right)$

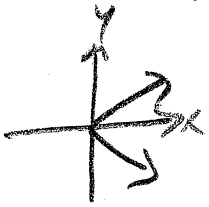
B. $y = \sin\left(\frac{1}{3}x + 2\pi\right)$

C. $y = \sin\left(\frac{2}{3}x + 2\pi\right)$

D. $y = \sin\left(\frac{1}{3}x + \pi\right)$

E. $y = \sin(6x + 3\pi)$

14. Approximate, to the nearest 0.1°, all angles θ in the interval [0°, 360°) that satisfy equation $\sec\theta = 2.3456$.



$\frac{1}{\sec\theta} = \frac{1}{2.3456}$

$\cos\theta = 0.4263$

$\theta_1 = \cos^{-1}(0.4263)$

$\theta_1 = 64.765°$

$\theta_2 = 360° - 64.8°$

$= 295.2°$

A. $\theta = 64.8°, 295.2°$

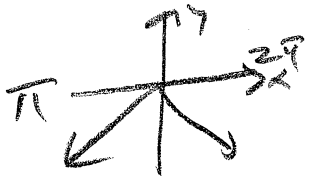
B. $\theta = 115.2°, 244.8°$

C. $\theta = 64.8°, 244.8°$

D. $\theta = 115.2°, 295.2°$

E. None of the above

15. Approximate, to the nearest 0.0001 radians, all angles θ in the interval [0, 2π) that satisfy equation $\sin\theta = -0.8765$



$\theta = \sin^{-1}(-0.8765)$

$\theta = 1.0685$

$\theta_R = 1.0685$

$\theta_1 = \pi + 1.0685 = 4.2101$

$\theta_2 = 2\pi - 1.0685 = 5.2146$

A. $\theta = 1.0685, 5.2146$

B. $\theta = 2.0730, 4.2101$

C. $\theta = 4.2101, 5.2146$

D. $\theta = 1.0685, 2.0730$

E. None of the above

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Question	Answer	Letter
1.	$41°2'51"$	C
2.	$200°32'7"$	A
3.	$133.7°$	D
4.	$\sec\theta = \frac{c}{\sqrt{c^2 - b^2}}$	B
5.	339 feet	D
6.	$\sec\theta - \cos\theta$	A
7.	$\sin\theta = \frac{-12}{13}$	B
8.	0	C
9.	$65°$	E
10.	$\cot(t) = \frac{-3}{4}$	D
11.	$\theta_R = 60°$	A
12.	Period $= 6$	B
13.	$y = \sin\left(\frac{1}{3}x + \pi\right)$	D
14.	$\theta = 64.8°, 295.2°$	A
15.	$\theta = 4.2101, 5.2146$	C