OU Math Day 2004

Trigonometry Test

1. The degree measure of an angle is 56°. What is its radian measure?
   (A) $\frac{14}{15}\pi$  (B) $\frac{45}{14}\pi$  (C) $\frac{14}{15}\pi$  (D) $\frac{45}{14}\pi$  (E) None of the above.

2. If $-\pi/2 \leq \theta \leq 0$ and $\cos(\theta) = 1/3$ then what is the value of $\sin(\theta)$?
   (A) $2\sqrt{2}/3$  (B) $3/\sqrt{10}$  (C) $-2\sqrt{2}/3$  (D) $-1/3$  (E) None of the above.

3. What is the value of $\cos(0^\circ)$?
   (A) 0  (B) $-1$  (C) $\pi$  (D) 1  (E) None of the above.

4. How many angles $\theta$ satisfy the equation $\theta = \cos(\theta)$? (Use radian measure for $\theta$.)
   (A) 0  (B) 1  (C) 2  (D) infinitely many  (E) None of the above.

5. If $\cot x = -\frac{2}{7}$ then $\tan x$ equals
   (A) $7/2$  (B) $-7/2$  (C) $3\sqrt{5}/7$  (D) $-3\sqrt{5}/7$  (E) None of the above.
6. On a circle with a radius of 20 inches what is the length of an arc intercepted by a central angle of $110^\circ$?

(A) $11\pi/9$ inches  (B) $110\pi/9$ inches  (C) $55\pi/9$ inches  (D) $2200\pi^2/9$ inches  (E) None of the above.

7. The addition formula for cosine states that, for all angles $A$ and $B$, $\cos(A + B)$ equals

(A) $\cos(A) \cos(B) + \sin(A) \sin(B)$
(B) $\cos(A) \cos(B) - \sin(A) \sin(B)$
(C) $\cos(A) \sin(B) - \sin(A) \cos(B)$
(D) $\cos(A) \sin(B) + \sin(A) \cos(B)$
(E) None of the above.

8. A right triangle has sides of length 3, 4 and 5. What is the cosine of the angle opposite the side with length 3?

(A) $\frac{3}{4}$  (B) $\frac{4}{5}$  (C) $\frac{3}{5}$  (D) $\frac{1}{2}$  (E) None of the above.

9. Using the fact that $\cos(\pi/6) = \sqrt{3}/2$ the value of $\cos(\pi/12)$ is

(A) $\sqrt{3}/4$  (B) $1/2$  (C) $(2 - \sqrt{3})/2$  (D) $\frac{\sqrt{2+\sqrt{3}}}{2}$  (E) None of the above.

10. Find the sum of all of the solutions to the equation $\sin(2x) - \cos(x) = 0$ in the interval $0 \leq x \leq \pi/2$. (Use radian measure for $x$.)

(A) $\frac{2\pi}{3}$  (B) $\frac{\pi}{2}$  (C) $\pi$  (D) 0  (E) None of the above.
11. A sine wave function \( f(x) = a \sin(bx) \) has amplitude 100 and period 20. What are the values of \( a \) and \( b \)?

(A) \( a = 10, b = 10/\pi \)  
(B) \( a = 100, b = \pi/10 \)  
(C) \( a = 100, b = 10/\pi \)  
(D) \( a = 10, b = \pi/10 \)  
(E) None of the above.

12. The numerical value for \( \tan(30^\circ) + \tan(60^\circ) \) is

(A) 0  
(B) 1  
(C) \(-1\)  
(D) \( \frac{4}{3} \sqrt{3} \)  
(E) None of the above.

13. If \( \sec \theta \) is negative and \( \sin \theta \) is positive, which quadrant does \( \theta \) lie in?

(A) quadrant I  
(B) quadrant II  
(C) quadrant III  
(D) quadrant IV  
(E) None of the above.

14. In a right triangle the ratio of the lengths of the two non-hypotenuse legs is 20. Determine the sum of the cotangents of the angles of the triangle.

(A) \( -\frac{20}{401} \)  
(B) \( \frac{21}{\sqrt{401}} \)  
(C) \( \frac{19}{\sqrt{401}} \)  
(D) \( \frac{401}{20} \)  
(E) None of the above.

15. An observer standing at the same level 100 feet from the base of a radio tower an angle of 60° between the horizontal and the line of sight of the top of the tower. How tall is the tower?

(A) 100\( \sqrt{3} \) feet  
(B) 50 feet  
(C) \( \frac{100}{\sqrt{3}} \) feet  
(D) 200 feet  
(E) None of the above.

16. Determine the value of \( \sin^2(-x) + \cos(-x) - \sin^2(x) \cos(x) \) if you are given the information that \( \cos(x) = 1/4 \).

(A) \( -\frac{59}{64} \)  
(B) \( \frac{61}{64} \)  
(C) \( \frac{91}{64} \)  
(D) \( \frac{59}{64} \)  
(E) None of the above.