OU Math Day 2015

Trigonometry Test

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1. What is the degree measure equivalent of $\pi/6$ radians?

   (A) 30° (B) 45° (C) 60° (D) $7^\circ\,30'$ (E) None of the above.

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2. If $\cos\theta = -1$ then which of the following is a possible value for θ?

   (A) 0 (B) $13\pi/6$ (C) $9\pi/4$ (D) $7\pi/2$ (E) None of the above.

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3. In the interval $-\pi/2 \leq x \leq 15\pi/2$ how many times does the graph of $y = \tan(x)$ cross the x-axis?

   (A) 4 (B) 5 (C) 6 (D) 7 (E) None of the above.

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4. A clock tower casts a shadow 70 feet long when the angle of the sun (measured from the horizon) is 60°. How many feet tall is the tower?

   (A) $70\sqrt{3}$ (B) $210\sqrt{3}$ (C) 140 (D) $70/\sqrt{3}$ (E) None of the above.

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5. Let $S = \sin(2015^\circ)$ and $C = \cos(2015^\circ)$. Which of the following is true?

   (A) $S > 0$ and $C > 0$ (B) $S > 0$ and $C < 0$ (C) $S < 0$ and $C > 0$
   (D) $S < 0$ and $C < 0$ (E) None of the above.

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6. What is the value of $\cos(\pi/2)$?

(A) -1 (B) $-1/2$ (C) 0 (D) 1 (E) None of the above.

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7. Rewriting the expression

$$\frac{\tan^4(x)\sin(x)\cos^2(x)\csc^4(x)}{\sec^5(x)\cot^3(x)}$$

in terms of $\sin x$ and $\cos x$ results in which of the following?

(A) $\cos x/\sin x$ (B) $\sin^2 x$ (C) $\cos^3 x$ (D) $\sin^4 x$ (E) None of the above.

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8. Which of the following does not equal $\cos(2\theta)$ for all θ?

(A) $2\sin(\theta)\cos(\theta)$ (B) $2\cos^2(\theta) - 1$ (C) $\cos^2(\theta) - \sin^2(\theta)$ (D) $1 - 2\sin^2(\theta)$

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9. What is the length of an arc of a circle of radius 6 subtended by a central angle of 45 degrees?

(A) $3\pi/4$ (B) $9\pi/8$ (C) 3π (D) $3/4$ (E) None of the above.

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10. If $0 \leq \theta \leq \pi$ and $\cos(\theta) + \cos(\theta + \pi/2) = 0$ then θ equals

(A) 0 (B) $\pi/6$ (C) $\pi/4$ (D) π (E) None of the above.

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11. Find the numerical value of the product $\cos(45°)\sin(45°)\tan(45°)$.

(A) -1 (B) 0 (C) $1/2$ (D) $1/\sqrt{2}$ (E) None of the above.

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12. If $\sin\theta = 1/10$ and $0^\circ < \theta < 90^\circ$, what is $\tan\theta$?

(A) $1/\sqrt{99}$ (B) $1/\sqrt{9}$ (C) $10/\sqrt{99}$ (D) $\sqrt{99}$ (E) None of the above.

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13. Simplify $(1 - \csc\theta)(1 + \sin\theta)$

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

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14. In what quadrant does the point $(\cos\theta, \sin\theta)$ lie given that $\sec\theta < 0$ and $\cot\theta > 0$?

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

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15. If $3\sin^2(x) - 5\cos(x) = 1$ then $\cos(x)$ equals

(A) -2 (B) -2 or $1/3$ (C) $1/3$ (D) 1 (E) None of the above.

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16. If $\cot(\alpha) = 1/4$ then $1 + \cos^2(\alpha) + \tan^2(\alpha) - \sin^2(\alpha)$ equals

(A) 18 (B) 274/17 (C) 16 (D) 304/17 (E) None of the above.

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17. If $\cot(\alpha) = 1/4$ then $\sin(2\alpha)$ equals

(A) $-15/17$ (B) $1/2$ (C) $8/\sqrt{17}$ (D) $8/17$ (E) None of the above.

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18. What is the value of $\cos^2(44^\circ) + \cos^2(45^\circ) + \cos^2(46^\circ)$?

(A) 0 (B) 1 (C) 1.5 (D) 2 (E) None of the above.

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19. If x is any real number which of the listed statements is NOT true? (Assume that radian measure is used.)

(A) $\sec(-x) = \sec(x)$ (B) $\tan(-x) = -\tan(x)$ (C) $\sin(x+\pi) = -\sin(x)$
(D) $\cos(2x) = 2\cos^2(x) - 1$ (E) None of the above.

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20. Compute the exact value of $\tan(\cos^{-1}(\tan(\sin^{-1}\sqrt{2}/2)))$.

(A) undefined (B) 1 (C) 0 (D) $\sqrt{2}/2$ (E) None of the above.

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21. How many solutions does the equation $\sin(x) = x/10$ have? (Assume radian measure for x.)

(A) 0 (B) 1 (C) 5 (D) 7 (E) None of the above.

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22. Which of the four listed numbers is the largest?

(A) $\cos(\pi/4)$ (B) $\sec(\pi/4)$ (C) $\tan(\pi/4)$ (D) $\tan(-\pi/4)$

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23. Two sides of a triangle have lengths 5 and 6. If the sine of the angle between them is 1 then what is the length of the third side of the triangle?

(A) $\sqrt{11}$ (B) $3\sqrt{2}$ (C) $\sqrt{61}$ (D) $5\sqrt{6}$ (E) None of the above.

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24. Two sides of a triangle have lengths 5 and 6. If the sine of the angle between them is $2\sqrt{6}/5$ then what is the length of the third side of the triangle?

(A) 11 (B) $3\sqrt{2}$ (C) 7 (D) $5\sqrt{6}$ (E) None of the above.
