OU Math Day 2009

Trigonometry Test

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1. What is the value of $\tan(0°)$?

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

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2. What is the value of $\cot(0°)$?

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

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3. Which of the following equals $\tan^2(\theta) - \sec^2(\theta)$?

   (A) -1 (B) $\cot^2(\theta)$ (C) $\sin^2(\theta)$ (D) 1 (E) None of the above.

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4. A surveyor is positioned at the same horizontal level as the base of a building and 300 meters away from it. If the angle between the horizontal and the line of sight of the top of the building is 60°, how many meters tall is the building?

   (A) 150 (B) $100\sqrt{3}$ (C) $150\sqrt{3}$ (D) $300\sqrt{3}$ (E) None of the above.

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5. In radian measure 210° converts into

   (A) $7\pi/6$ (B) $37800/\pi$ (C) $7\pi/3$ (D) $7/25$ (E) None of the above.

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6. Let $\cos(\theta) = 3/5$ and $\sin(\theta) = -4/5$. In which of the four quadrants does θ lie?

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

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7. Let $\cos(\theta) = 3/5$ and $\sin(\theta) = -4/5$. What is the value of $\sin^2(\theta) + \cos^2(\theta)$?

(A) -1 (B) 1 (C) $-1/5$ (D) $7/5$ (E) None of the above.

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8. Let $\cos(\theta) = 3/5$ and $\sin(\theta) = -4/5$. What is the value of $\sin(-\theta)+\cos(-\theta)+\tan(\theta)+\sec(\theta)$?

(A) $2/15$ (B) $79/60$ (C) $26/15$ (D) $22/5$ (E) None of the above.

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9. Let $\cos(\theta) = 3/5$ and $\sin(\theta) = -4/5$. What is the value of $\sin(2\theta)$?

(A) $-24/25$ (B) $-7/25$ (C) $7/25$ (D) $24/25$ (E) None of the above.

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10. Let $\cos(\theta) = 3/5$ and $\sin(\theta) = -4/5$. What is the value of $\tan(2\theta)$?

(A) $-24/7$ (B) $-7/24$ (C) $7/24$ (D) $24/7$ (E) None of the above.

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11. $\cos(60°) + \sec(60°)$ equals

(A) 1 (B) $5/2$ (C) $7\sqrt{3}/6$ (D) $(1+\sqrt{3})/2$ (E) None of the above.

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12. The addition formula for sine asserts that $\sin(A+B)$ equals

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

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13. $\sin(3\pi/2 + A)) =$

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

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14. $\cos(0) + \cos(\pi/4) + \cos(\pi/2) + \cos(3\pi/4) + \cos(\pi) =$

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

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15. Two sides of a triangle have lengths 5 and 6. If the cosine of the angle between them is $1/5$ 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.

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16. On a circle whose radius is 45 inches what is the length in inches of the arc subtended by a central angle of $100°$?

(A) $5\pi/9$ (B) $5\pi/18$ (C) 25π (D) 50π (E) None of the above.

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17. How many angles with radian measure between $-\pi$ and π have their tangent equal to $\sqrt{3}$?

(A) 0 (B) 2 (C) 3 (D) 4 (E) None of the above.

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18. One side of a right triangle has length 5 and the hypotenuse has length 11. What is the tangent of the angle opposite the side of length 5?

(A) $\dfrac{4\sqrt{6}}{11}$ (B) $\dfrac{5}{11}$ (C) $\dfrac{11}{96}$ (D) $\dfrac{5}{4\sqrt{6}}$ (E) None of the above.

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19. How many solutions does the equation $\sin(2x) - \cos(x) = 0$ have with $0 \le x \le 2\pi$?

(A) 2 (B) 3 (C) 4 (D) 5 (E) None of the above.

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20. The expression

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

simplifies to

(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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21. Two sides of a triangle have length 5 and 6. Let α be the angle opposite the side of length 5 and let β be the angle opposite the side of length 6. If $\sin\alpha = 2\sqrt{6}/7$ then what is $\sin\beta$?

(A) $2\sqrt{5}/7$ (B) $12\sqrt{6}/35$ (C) $5/7$ (D) $6/7$ (E) None of the above.
