OU Math Day 2012

Trigonometry Test

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1. How many angles θ satisfy the equation $\sin^2(\theta) + \cos^2(\theta) = 1/2$?

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

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2. Find the acute angle formed by the intersecting lines $y = x$ and $y = -2x$.

   (A) 15° (B) 30° (C) 45° (D) 75° (E) None of the above.

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3. The sine of an angle in the first quadrant equals .28 . What does the cosine of half the angle equal?

   (A) $\sqrt{.14}$ (B) .8 (C) .75 (D) .6 (E) None of the above.

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4. The addition formula for sine states, for all angles A and B, that $\sin(A + B)$ 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.

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5. What is the degree measure equivalent of $\pi/32$ radians?

   (A) $5^\circ\, 37'\, 30''$ (B) $5^\circ\, 15'\, 12''$ (C) $5^\circ\, 6'\, 25''$ (D) $5^\circ\, 45'\, 45''$ (E) None of the above.

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6. How many angles whose radian measure is between -2π and 2π inclusive have their tangent equal to -1?

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

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

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

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8. 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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9. 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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10. 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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11. Determine the value of $\cos(-x)\sin^3(x) + \cos^3(x)\sin(-x)$ given that x is an acute angle with $\cos(x) = 1/3$.

(A) $\frac{2\sqrt{2}}{9}$ (B) 0 (C) $-\frac{14\sqrt{2}}{81}$ (D) $-\frac{2\sqrt{2}}{9}$ (E) None of the above.

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

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

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13. If $\arctan(x) = \pi/2$ then a possible value for x is

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

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14. If $\sec(x) = \sqrt{7}$ then which of the following does $\tan(x)$ equal?

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

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15. How many solutions does the equation $2\sin(3\alpha) = 1$ have if $0 \leq \alpha \leq \pi$?

(A) 0 (B) 2 (C) 4 (D) 6 (E) None of the above.

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16. A circle has a radius of 10 feet. Find the length, in feet, of the arc intercepted by a central angle of 200°.

(A) $50\pi/9$ (B) $100\pi/9$ (C) $500\pi/9$ (D) $18\pi/5$ (E) None of the above.

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17. If $-90° < x < 0$ and $\sin(x) = 2/3$ then what does $\cos(x)$ equal?

(A) $3/2$ (B) $2/\sqrt{5}$ (C) $-\sqrt{5}/3$ (D) $-5/9$ (E) None of the above.

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18. Suppose that $\tan\theta = -\frac{5}{3}$ and $\sec\theta = -\frac{\sqrt{34}}{3}$. What is $\csc\theta$?

(A) $\frac{5}{\sqrt{34}}$ (B) $-\frac{3}{\sqrt{34}}$ (C) $\frac{\sqrt{34}}{5}$ (D) $-\frac{3}{5}$ (E) None of the above.

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19. 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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20. If $\tan\theta$ and $\sec\theta$ are both negative, which quadrant does θ lie in?

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

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21. Rewriting the expression

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

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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22. Find $\sin(u-v)$ if $\sin u = -3/5$ and $\tan v = 12/5$ where u is in Quadrant IV and v is in Quadrant III.

(A) $\frac{63}{65}$ (B) $-\frac{33}{65}$ (C) $\frac{56}{65}$ (D) $\frac{16}{65}$ (E) None of the above.

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

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

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24. What is the value of $\sin^2(0°)+\sin^2(1°)+\sin^2(2°)+\sin^2(3°)+\cdots+\sin^2(90°)$?

(A) 0 (B) 45 (C) 45.5 (D) 90 (E) None of the above.

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25. In a right triangle the hypotenuse has length 20 and the the sum of the cotangents of all three angles of the triangle equals 2. What are the lengths of the other two sides of the triangle?

(A) 10 and $10\sqrt{3}$ (B) $10\sqrt{2}$ and $10\sqrt{2}$ (C) 2 and $6\sqrt{11}$ (D) 8 and $4\sqrt{21}$
(E) None of the above.
