OU Math Day 2006

Trigonometry Test

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1. Find the numerical value of $\cos(30°) + \sin(30°) + \tan(30°)$.

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

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

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

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3. A radio tower casts a shadow 70 feet long when the angle of the sun (measured from the horizon) is 60°. How tall is the 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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4. The addition formula for sine states that, for all angles A and B, $\sin(A + B)$ 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 value of $\cot(-45°)$?

   (A) 0 (B) -1 (C) ∞ (D) 1 (E) None of the above.

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6. If $\sin\theta$ is negative and $\sec\theta$ is positive, which quadrant does θ lie in?

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

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7. Determine the value of $\tan^2(\theta)$ given that $\sin(\theta - \pi) = .3$

(A) $\sqrt{.91}$ (B) $9/91$ (C) $.91$ (D) $-.91$ (E) None of the above.

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8. The hypotenuse of a right triangle has length 9 and one of the other edges has length 4. What is the cosecant of the angle between these two sides of the triangle?

(A) $9/\sqrt{65}$ (B) $\sqrt{65}/4$ (C) $\sqrt{65}/9$ (D) $4/9$ (E) None of the above.

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9. The hypotenuse of a right triangle has length 9 and one of the other edges has length 4. What is the cosine of the angle between these two sides of the triangle?

(A) $9/\sqrt{65}$ (B) $\sqrt{65}/4$ (C) $\sqrt{65}/9$ (D) $4/9$ (E) None of the above.

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10. $(\sin(x) + \cos(-x))^2$ is equal to

(A) $1 + \sin(2x)$ (B) 1 (C) 0 (D) $1 - \sin(2x)$ (E) None of the above.

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11. How many angles whose radian measure is between 0 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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12. If $0 < x < 90^\circ$ and $\sin x = 0.6$ then $\tan x =$

(A) 0.25 (B) 0.45 (C) 0.75 (D) 0.8 (E) None of the above.

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13. 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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14. Simplify $\dfrac{\cos x}{1+\sin x} + \dfrac{1+\sin x}{\cos x}$

(A) $\sec x \tan x$ (B) $2\sec x$ (C) $2\csc x$ (D) $\sec x$ (E) None of the above.

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15. If two lines in a plane are perpendicular what is the cosine of the angle between the lines?

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

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16. How many angles θ satisfy the equation $\sin(\theta) = \sec(\theta)$? (Use radian measure for θ.)

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

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17. A sine wave function $f(x) = a\sin(bx)$ has amplitude 10 and period 40. What are the values of a and b?

(A) $a = 10$ and $b = 20/\pi$ (B) $a = 10$ and $b = 1/40$ (C) $a = 10$ and $b = \pi/20$
(D) $a = 10$ and $b = 40$ (E) None of the above.

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18. 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.

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19. If $\cos 2x = 1/9$ then $\sin x =$

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