OU Math Day 2013

Trigonometry Test

(with answers on the last page)

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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. The sum $\cos(0) + \cos(\pi/2) + \cos(\pi) + \cos(3\pi/2) + \cos(2\pi) + \cos(5\pi/2) + \cos(3\pi)$ equals

   (A) -1 (B) 0 (C) 1 (D) 4 (E) None of the above.

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3. Let θ be the angle with degree measure 15°. 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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4. 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.

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5. How many angles θ with radian measure between 0 and 2π satisfy the equation $\cos^2(\theta) = \sin^2(\theta) + 1/2$?

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

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6. In the interval $-3\pi/2 \le x \le 11\pi/2$ how many times does the graph of $y = \sin(x)$ cross the x-axis?

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

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7. Let $\cos(\theta) = -1/3$ and $\sin(\theta) = -2\sqrt{2}/3$. 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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8. Which of the following equals $\cot^2(\theta) - \csc^2(\theta)$?

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

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9. What is the length of an arc of a circle of radius 6 subtended by a central angle of $\pi/4$ radians?

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

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10. The cosine of an acute angle equals .62 . What does the cosine of half the angle equal?

(A) $\sqrt{.38}$ (B) .9 (C) .38 (D) .81 (E) None of the above.

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11. How many angles whose radian measure is between 0 and π inclusive have their tangent equal to -2?

(A) 0 (B) 1 (C) 2 (D) 3 (E) None of the above.

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12. 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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13. 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.

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14. 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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15. 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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16. 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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17. A tree casts a shadow 40 feet long when the angle of the sun (measured from the horizon) is $60°$. How tall is the tree in feet?

(A) $40\sqrt{3}$ (B) $120\sqrt{3}$ (C) 80 (D) 40 (E) None of the above.

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18. In the xy-plane, the degree measure of the acute angle that the line $y = x/\sqrt{3}$ forms with the x-axis is

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

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19. In a right triangle the length of the hypotenuse is 10 and the the sum of the cotangents of all three angles of the triangle is 2. What are the lengths of the other two sides of the triangle?

(A) 5 and $5\sqrt{3}$ (B) $5\sqrt{2}$ and $5\sqrt{2}$ (C) 1 and $3\sqrt{11}$ (D) 4 and $2\sqrt{21}$
(E) None of the above.

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20. If x is an angle in the first quadrant and $\sin(x) = \dfrac{2}{7}$ then determine $\tan(2x)$.

(A) $\dfrac{6\sqrt{3}}{41}$ (B) $\dfrac{9\sqrt{5}}{41}$ (C) $\dfrac{12\sqrt{5}}{41}$ (D) $\dfrac{18\sqrt{3}}{41}$ (E) None of the above.

ANSWERS:

1. A
2. B
3. B
4. B
5. C
6. D
7. C
8. A
9. E
10. B
11. B
12. C
13. C
14. E
15. C
16. C
17. A
18. B
19. B
20. C