OU Math Day 2024

# Trigonometry Test

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1. Which of the following is True?

   (A) $\sec t = \dfrac{1}{\sin t}$ (B) $\csc t = \dfrac{1}{\cos t}$ (C) $\sin t = \dfrac{\tan t}{\cos t}$ (D) $\cot t = \dfrac{\csc t}{\sec t}$ (E) None of the above

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2. What is the amplitude of the function $y = -3\sin(2x)$?

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

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3. Which of the following does not describe the characteristics of the graph of $y = \tan x$?

   (A) Period is $\pi$ (B) Even function (C) Domain is all real numbers except odd multiples of $\pi/2$ (D) Range is all real numbers (E) None of the above

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4. Determine the period and phase shift of $y = 4\sin\left(2x - \dfrac{2\pi}{3}\right)$.

   (A) period is $\pi$, phase shift is $\pi$ (B) period is $2\pi$, phase shift is $\pi/3$ (C) period is $\pi$, phase shift is $\pi/3$ (D) period is $2\pi$, phase shift is $\pi/2$ (E) None of the above

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5. Which of the following is equal to $\cos 2x$ for all values of $x$?

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

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6. Convert $-135°$ into radians.

   (A) $-\pi/135$ (B) $5/\pi$ (C) $-3\pi/4$ (D) $\pi/5$ (E) None of the above

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7. If $\sin t = 3/5$ and $0 \leq t \leq \pi/2$, what is $\cos t$?

   (A) $4/5$ (B) $1/2$ (C) $\sqrt{3}/5$ (D) $1/25$ (E) None of the above

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8. If $\tan\theta = 3$ and $\pi < \theta < 3\pi/2$, what is $\sin\theta$?

   (A) $10/3$ (B) $-3/\sqrt{10}$ (C) $\sqrt{3}/10$ (D) $3$ (E) None of the above

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9. Assume the orbit of Mercury around the sun is a perfect circle. Mercury is approximately 36 million miles from the sun. In one Earth day, Mercury completes 0.0114 of its total revolution. How many miles does it travel in one day?

   (A) $\approx 2.58$ million miles (B) $\approx 10$ million miles (C) $\approx 1$ million miles (D) $\approx 1.14$ million miles (E) We need more information

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10. Find the value of $\tan(-5\pi/4)$?

    (A) $-1$ (B) $1$ (C) Does not exist (D) $-\pi/4$ (E) None of the above

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11. If $\tan\theta < 0$ and $\cos\theta > 0$, name the quadrant in which $\theta$ lies.

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

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12. $(\sec(\theta) - \tan(\theta))(\sec(\theta) + \tan(\theta))$ is equal to:

    (A) $2\theta$ (B) $1$ (C) $-1$ (D) $2\tan(\theta)$ (E) None of the above

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13. Suppose that the terminal side of an angle $\theta$, when plotted contains the point $Q(4, -2)$. Find $\sin(\theta)$.

    (A) $2/\sqrt{5}$ (B) $-1/\sqrt{5}$ (C) $4$ (D) $\sqrt{5}$ (E) None of the above

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14. An automatic sprinkler sprays a distance of 20 feet while rotating 30 degrees. What is the area of the sector of grass the sprinkler waters?

(A) $\approx 104.72$ ft$^2$ (B) 100 ft$^2$ (C) 20 ft$^2$ (D) 40 ft$^2$ (E) None of the above

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15. How many solutions does the equation $2\cos^2 x + 3\sin x = 0$ have in the interval $[0, 2\pi)$.

(A) 2 (B) 3 (C) 4 (D) 1 (E) None of the above

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16. A right triangle has one angle of 60° and a hypotenuse of length 20. What are the lengths of the other two sides?

(A) 10 and $10\sqrt{3}$ (B) 15 and 5 (C) 10 and 10 (D) 4 and 16 (E) None of the above

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17. How many solutions does the equation $\sin(2x) = \cos(x)$ have in the interval $0 \leq x < 2\pi$?

(A) 4 (B) 3 (C) 2 (D) 1 (E) None of the above

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18. Which of the following statements is False?

(A) $\cos(x)$ is an even function (B) $\sin(x)$ is an odd function (C) The domain of $\sin(x)$ and $\cos(x)$ is $(0, \infty)$ (D) The range of $\sin(x)$ and $\cos(x)$ is [-1,1] (E) None of the above

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19. $\sin x \tan x + \cos x$ is equal to:

(A) $\csc x$ (B) $\sec x$ (C) $-\cos x$ (D) $-\cot x$ (E) None of the above

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20. A wind machine used to generate electricity has blades that are 10 feet in length. The propeller is rotating at 4 revolutions per second. Find the linear speed, in feet per second, of the tips of the blades.

(A) $80\pi$ (B) $10\pi$ (C) $40\pi$ (D) $20\pi$ (E) None of the above

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