OU Math Day 2011

Trigonometry Test

(with answers on the last page)

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1. What is the value of $\cos(90^\circ)$?

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

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2. Which of the following equals $\dfrac{\cos(\theta)\tan(\theta)}{\sin(\theta)}$?

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

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3. If $\tan\theta$ and $\cos\theta$ 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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4. How many angles α satisfy the equation $\sin^2(\alpha) + \cos^2(\alpha) = 1/2$?

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

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5. Let $S = \sin(2011^\circ)$ and $C = \cos(2011^\circ)$. Which of the following is true?

   (A) $S > 0$ and $C > 0$ (B) $S > 0$ and $C < 0$ (C) $S < 0$ and $C > 0$
   (D) $S < 0$ and $C < 0$ (E) None of the above.

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6. If $\sin(x) = \dfrac{1}{\sqrt{7}}$ then $\sec(x)$ equals

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

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7. A right triangle has sides of length 5, 12 and 13 cm. What is the secant of the angle opposite the side of length 12?

(A) $\dfrac{13}{5}$ (B) $\dfrac{5}{13}$ (C) $\dfrac{12}{5}$ (D) $\dfrac{8}{5}$ (E) None of the above.

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8. A right triangle has sides of length 5, 12 and 13 cm. What is the secant of the angle opposite the side of length 13?

(A) $\dfrac{13}{5}$ (B) $\dfrac{5}{13}$ (C) $\dfrac{12}{5}$ (D) $\dfrac{8}{5}$ (E) None of the above.

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9. If x is any real number which of the listed statements is NOT true? (Assume that radian measure is used.)

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

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10. How many times does the graph of $y = \cos(x)$, where $0 \le x \le 5\pi$, cross the x-axis ?

(A) 3 (B) 4 (C) 5 (D) 6 (E) None of the above.

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11. If $\tan(\phi) = 8/7$ then what is the absolute value of $\sin(\phi)$?

(A) $\dfrac{7}{\sqrt{113}}$ (B) $\dfrac{113}{8}$ (C) $\dfrac{8}{\sqrt{113}}$ (D) $\dfrac{\sqrt{113}}{7}$ (E) None of the above.

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12. If θ is an angle with $0° < \theta < 90°$ and $\sin\theta = \dfrac{a}{b}$ what is $\tan\theta$?

(A) $\dfrac{\sqrt{b^2-a^2}}{a}$ (B) $\dfrac{\sqrt{b^2-a^2}}{b}$ (C) $\dfrac{a}{\sqrt{b^2-a^2}}$ (D) $\dfrac{b}{\sqrt{b^2-a^2}}$ (E) None of the above.

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13. The degree measure of an angle is 56°. What is its radian measure?

(A) $\dfrac{28\pi}{45}$ (B) $\dfrac{7\pi}{45}$ (C) $\dfrac{56}{360}$ (D) $\dfrac{14\pi}{45}$ (E) None of the above.

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14. Which of the four listed numbers is the largest?

(A) $\cos(\pi/4)$ (B) $\sec(\pi/4)$ (C) $\tan(\pi/4)$ (D) $\tan(-\pi/4)$

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15. If $\sin(x+\frac{\pi}{4}) - \cos(x+\frac{\pi}{6})$ is written in the form $A\sin(x) + B\cos(x)$ then what is B?

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

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16. Which of the following equals $\cos(2\arcsin(1/5))$?

(A) $2/25$ (B) $2\sqrt{6}/25$ (C) $2\sqrt{6}/5$ (D) $23/25$ (E) None of the above.

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17. The expression $\dfrac{\tan(x)\sec^2(x)\sin(x)}{\csc^3(x)\cos^2(x)\cot(x)}$ simplifies to

(A) $\tan^6(x)$ (B) 1 (C) $\cot^4(x)$ (D) $\cos^3(x)$ (E) None of the above.

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18. If $\sin(\theta) = 1/9$ then what does $\sin(2\theta)$ equal?

(A) $\dfrac{2}{9}$ (B) $\dfrac{8\sqrt{5}}{81}$ (C) $\dfrac{79}{81}$ (D) $\dfrac{81}{79}$ (E) None of the above.

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19. The straight line $y = mx$ where $m > 0$ forms an angle of 30° with the positive x-axis. What does m equal?

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

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20. The cosine 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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21. Find $\sin\left(\arctan\left(\sec\left(\arccos\left(\tan\left(\arcsin\left(\dfrac{-1}{\sqrt{2}}\right)\right)\right)\right)\right)\right)$.

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

ANSWERS:

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