

For all questions, answer choice (e) NOTA stands for “None of These Answers”

- If $\sec(\theta) > 0$ and $\sin(\theta) < 0$, which of the following *could be* the angle θ ?
(a) -1019° (b) -3128° (c) -1492° (d) -3767° (e) NOTA
- Albert the Alligator stands in the middle of the University of Florida campus and looks up at the top of Century Tower (he is in awe of a banner proclaiming the Gators as “2006 football *and* basketball national champions”). The angle of elevation to the top of the tower is 30° . Albert then walks a certain distance and looks up at the top of the tower once again. The new angle of elevation is 45° . If the distance between Albert and the base of the tower is now 100ft, how far did Albert walk?
(a) $100(\sqrt{2} + 1)$ (b) $100(\sqrt{2} - 1)$ (c) $100(\sqrt{3} - 1)$ (d) $100\sqrt{3}$ (e) NOTA
- Solve for x: $(2^x)(4^{2x+1}) = 8$.
(a) $1/5$ (b) $2/3$ (c) $4/5$ (d) $2/5$ (e) NOTA
- Simplify: $\frac{\sin(12x) + \sin(2x)}{\cos(12x) - \cos(2x)}$.
(a) $\cot(5x)$ (b) $\tan(12x)$ (c) $\tan(5x)$ (d) $\tan(7x)$ (e) NOTA
- $f(x) = \log_x(x+1)$ for all values of $x > 1$.
 $\prod_4^{31} f(x) = ?$
(a) $3/5$ (b) $5/2$ (c) $4/5$ (d) $1/2$ (e) NOTA
- Find the area of the conic section: $2x^2 + 8x + 3y^2 - 12y - 4 = 0$.
(a) 24π (b) $4\sqrt{6}\pi$ (c) 96π (d) $6\sqrt{3}$ (e) NOTA
- Find the sum of all possible values of θ on the interval $[0, 2\pi)$ such that $\tan^2(\theta) = \frac{1}{3}$ and $\sin(\theta) < 0$.
(a) 3π (b) 4π (c) π (d) $7\pi/6$ (e) NOTA
- Which of the following trig ratios could not be π ?
(a) $\cos(\theta)$ (b) $\tan(\theta)$ (c) $\csc(\theta)$ (d) $\cot(\theta)$ (e) NOTA

9. $\cos(22.5^\circ) = ?$

- (a) $(1/4)(\sqrt{2} + \sqrt{6})$ (b) $(1/4)(\sqrt{2 + \sqrt{2}})$ (c) $(1/4)\sqrt{2 - \sqrt{2}}$ (d) $\sqrt{6}$ (e) NOTA

10. The following transformations are performed in order on the graph of $f(x) = \sin(x)$.

- i. Reflection through the x-axis
- ii. Horizontal shrink by a factor of $1/4$
- iii. Reflection through the y-axis
- iv. Horizontal translation π units to the left
- v. Vertical stretch by a factor of 3

Which of the following is the graph, g, of the resulting function?

- (a) $g(x) = 3\sin(1/4(x - \pi))$ (b) $g(x) = -3\sin(-1/4(x - \pi))$ (c) $g(x) = -1/3\sin(4(\pi - x))$
 (d) $g(x) = -3\sin(-4(x + \pi))$ (e) NOTA

11. Find an algebraic expression equivalent to $\sin[\arcsin(x) + \arccos(x)]$.

- (a) 1 (b) $\tan(x)$ (c) $2x^2 - 1$ (d) $x + \sqrt{1 - x}$ (e) NOTA

12. If $f(x) = 2x + 8$, $g(x) = \frac{4x - 2}{x}$ and $h(x) = g(f(x))$, then $h^{-1}(x) = ?$

- (a) $\frac{30 - 8x}{x - 8}$ (b) $\frac{x + 4}{4x + 15}$ (c) $\frac{15 + 4x}{x + 8}$ (d) $\frac{15 - 4x}{x - 4}$ (e) NOTA

13. Solve for x: $\ln(x + 2) + \ln(x + 8) = 0$

- (a) $\frac{e - 10}{2}$ (b) $-5 \pm \sqrt{10}$ (c) $-10 + 2\sqrt{10}$ (d) $-10 - 2\sqrt{10}$ (e) NOTA

14. $f(x) = [1 + \tan(x)]^2 - \sec^2(x)$.

If A is the amplitude of $f(x)$ and P is the period of $f(x)$, find $\frac{AP}{2}$.

- (a) 2π (b) π (c) $2/\pi$ (d) 1 (e) NOTA

15. Which of the following is *not* an element of the domain of $f(x) = \cot(x)$

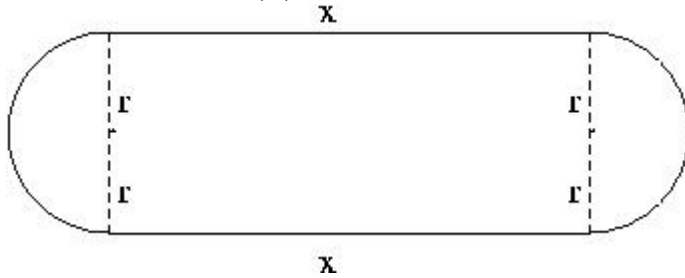
- (a) -240° (b) 450° (c) 1440° (d) -405° (e) NOTA

16. The terms in the expansion of $(x + 2/x^2)^9$ are written from left to right in descending powers of x . Which term is the constant term?
- (a) 4^{th} (b) 6^{th} (c) 8^{th} (d) 10^{th} (e) NOTA
17. Which of the following is/are true?
- I. $\cos(2x) = 1 - \cos^2(x)$ II. $\sin(2x) = 2\tan(x)\cos^2(x)$
- III. $\cos(2x) = 1 - 2\sin^2(x)$ IV. $\tan(x) = \sqrt{\sec(x) - 1}$
- (a) I only (b) I and II only (c) II and III only (d) all are true (e) NOTA
18. Charlie can solve a problem twice as fast as Jim and Jim can solve the same problem twice as fast as Donna. When all three people work on the problem together, it takes them 10 minutes to solve it. How long does it take Jim to solve the problem?
- (a) 35 minutes (b) 18 minutes (c) 36 minutes (d) 72 minutes (e) NOTA
19. Triangle ABC has angles A, B and C and sides a, b and c. Side a is opposite angle A, side b is opposite angle B, and side c is opposite angle C. $A = 30^\circ$, $b = 10$, $c = 10$ and $a = \sqrt{x - y\sqrt{z}}$ where x , y and z are positive integers. Find $x + y + z$.
- (a) 300 (b) 301 (c) 302 (d) 303 (e) NOTA
20. Which of the following is the locus of points equidistant from a particular point in space?
- (a) Hyperbola (b) Ellipse (c) Parabola (d) Circle (e) NOTA
21. The general form for a conic section is $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$. If $B^2 - 4AC = 0$, then the type of section could *not* be which of the following?
- (a) parabola (b) 2 parallel lines (c) 1 line (d) hyperbola (e) NOTA
22. If $\sin(\theta) = 3/5$ and $\pi/2 < \theta < 3\pi/2$, then $\cos(\theta) + \cot(\theta) = ?$
- (a) $8/15$ (b) $-32/15$ (c) $-31/20$ (d) $-9/10$ (e) NOTA
23. In a circle whose diameter is 16 cm, a central angle θ intercepts an arc of length 3 cm. What is the radian measure of the angle θ ?
- (a) $9/16$ (b) $3/8$ (c) $9\pi/16$ (d) $3\pi/8$ (e) NOTA

24. If $\log_b x = 2.3$ and $\log_b y = 3.1$, find $\log_b(b^5 x^2/y^3)$.

- (a) 0.3 (b) 10.4 (c) 3 (d) - 4.7 (e) NOTA

25. Florida Field (better known as “The Swamp”) has the shape of a rectangular region with semicircular regions at each end. If the perimeter of the field is 400 yards, express the area of the field as a function of the radius, r , of the semicircles.



- (a) $f(r) = 400\pi r$ (b) $f(r) = 2r(200 - \pi r)$ (c) $f(r) = r(400 - \pi r)$
 (d) $f(r) = 400r + \pi r^2$ (e) NOTA

26. What is the remainder when 2^{519} is divided by 5?

- (a) 1 (b) 2 (c) 3 (d) 4 (e) NOTA

27. Find the minimum value of the function $f(x) = 2x^2 + 2x + 5$.

- (a) 9/2 (b) 19/4 (c) 0 (d) 5 (e) NOTA

28. Find an equation of the circle which has the line segment from $P(-2, 3)$ to $Q(6, -1)$ as a diameter.

- (a) $(x - 4)^2 + (y - 1)^2 = 400$ (b) $(x - 2)^2 + (y - 1)^2 = 20$ (c) $(x - 4)^2 + (y - 1)^2 = 20$
 (d) $(x - 2)^2 + (y - 1)^2 = 400$ (e) NOTA

29. What is the discriminant ($b^2 - 4ac$) of the quadratic function with leading coefficient one and roots that are each two greater than those of the equation: $x^2 + 4x - 8 = 0$

- (a) 48 (b) - 48 (c) $4\sqrt{3}$ (d) - 16 (e) NOTA

30. What is the least possible score you cannot achieve on this test if you receive 4 points for a correct response, 0 points for a response left blank, and -1 points for an incorrect response?

- (a) 107 (b) 109 (c) 113 (d) 117 (e) NOTA