

Select (E) NOTA if none of the above answers are correct. Good luck!

- Simplify the expression $\frac{\tan x + \sec x}{\sec x}$, where defined.
 (A) 1 (B) $\sin x$ (C) $\cos x$ (D) $\sin x + 1$ (E) NOTA
- Compute the value of $a + b$ where $\begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix} \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} 5 \\ 6 \end{bmatrix}$.
 (A) 2 (B) 2.1 (C) 2.2 (D) 3 (E) NOTA
- Given that $\sin \alpha = \frac{12}{13}$ and $\cos \beta = \frac{3}{5}$, where $\frac{\pi}{2} < \alpha < \pi$ and $\frac{3\pi}{2} < \beta < 2\pi$, find $\tan(\alpha + \beta)$.
 (A) $-\frac{56}{33}$ (B) $-\frac{16}{63}$ (C) $\frac{56}{33}$ (D) $\frac{63}{16}$ (E) NOTA
- Compute the minimum distance between the point $(6, 0)$ and the curve $y = 2\sqrt{x}$.
 (A) 4 (B) $2\sqrt{5}$ (C) $2\sqrt{6}$ (D) 6 (E) NOTA
- Evaluate $\lim_{x \rightarrow \infty} (\sqrt{x^2 + 2010x + 1337} - \sqrt{x^2 + 10x + 2010})$.
 (A) 1000 (B) 1005 (C) 2000 (D) 2010 (E) NOTA
- A particle travels according to the parametric equations $x(t) = 2t^2 + 8t + 9$ and $y(t) = t + 3$. Compute the sum of all values of A such that the particle passes through the point $(1, A)$.
 (A) -4 (B) 0 (C) 1 (D) 4 (E) NOTA
- Evaluate $\lim_{x \rightarrow 4} \frac{\sqrt{x+5} - 3}{x-4}$.
 (A) 0 (B) $\frac{1}{3}$ (C) $\frac{1}{6}$ (D) does not exist (E) NOTA
- Eli has 12 blue socks, 7 pink socks, and 5 black socks in his sock drawer. How many socks must he pull from the drawer (at random) to ensure that he has at least one pair of matching socks?
 (A) 4 (B) 14 (C) 21 (D) 22 (E) NOTA
- Which of the following pairs does **not** contain disjoint sets?
 (A) complex numbers, real numbers
 (B) irrational numbers, non-real numbers
 (C) rational numbers, $\{\pi\}$
 (D) real numbers, imaginary numbers
 (E) NOTA
- Let $P(X)$ denote the probability of an event X occurring. Given that $P(A) = 0.25$, $P(B) = 0.5$, and $P(A \cup B) = 0.75$, compute $P(A \cap B)$.
 (A) 0 (B) 0.125 (C) 0.75 (D) not enough info (E) NOTA
- A circle is rotated about its diameter of length 6. Find the volume of the resulting solid.
 (A) 9π (B) 27π (C) 36π (D) 288π (E) NOTA
- What is the sum of all values of ω satisfying the equation $4^\omega - 3 \cdot 2^\omega + 2 = 0$.
 (A) 1 (B) 2 (C) 3 (D) 4 (E) NOTA

13. Which of the following is **not** equivalent to the expression $(\sin x + \cos x)^2$?
- (A) $\sin^2 x + 2 \sin x \cos x + \cos^2 x$
(B) $1 + 2 \sin x \cos x$
(C) $1 + \sin 2x$
(D) 1
(E) NOTA
14. Identify the locus of points defined by $(2, a^2)$ on the interval $a \in (-\infty, \infty)$.
- (A) circle (B) line (C) parabola (D) ray (E) NOTA
15. A company sells x items charging \$ $(-.04x^2 + x + 1)$ per item. Determine the company's revenue.
- (A) $\$(-.04x + 1 + \frac{1}{x})$ (B) $\$(-.04x + x + 1)$ (C) $\$(-.04x^3 + x^2 + 1)$ (D) $\$(-.04x^3 + x^2 + x)$ (E) NOTA
16. Compute the maximum value of the function $f(x) = x^2 + 2x + 3$.
- (A) -2 (B) -1 (C) 2 (D) 3 (E) NOTA
17. Convert 235° to radians.
- (A) $\frac{47\pi}{72}$ (B) $\frac{47\pi}{36}$ (C) 235π (D) $\frac{42300}{\pi}$ (E) NOTA
18. If the arc on a 45° sector of circle A has the same length as the arc on a 30° sector of circle B , what is the ratio of the area of circle A to circle B ?
- (A) $\frac{4}{9}$ (B) $\frac{2}{3}$ (C) $\frac{3}{2}$ (D) $\frac{9}{4}$ (E) NOTA
19. The decimal (base 10) number 144 is equivalent to 121_b , where b represents a base. Compute the value of b .
- (A) 9 (B) 11 (C) 12 (D) 13 (E) NOTA
20. Determine the slope of the graph of $|-2x + 2010|$ at $x = 1006$.
- (A) -2 (B) 0 (C) 2 (D) undefined (E) NOTA
21. The triangle of the year is defined as the right triangle such that the sides form an arithmetic progression, with the difference between the length of the hypotenuse and the shorter leg is equal to the year. Determine the length of the longer leg in the 2010 triangle of the year.
- (A) 2010 (B) 3015 (C) 4020 (D) 5025 (E) NOTA
22. Evaluate $\sin^2 x + \sec^2 x + \cot^2 x - \tan^2 x + \cos^2 x - \csc^2 x$, where defined.
- (A) -1 (B) 0 (C) 1 (D) 3 (E) NOTA
23. Evaluate $\lim_{x \rightarrow 0^+} \frac{e^{\ln x}}{x}$.
- (A) 0 (B) 1 (C) e (D) does not exist (E) NOTA
24. Given that $x^2 + \frac{1}{x^2} = 7$, compute the value of $x^2 - \frac{1}{x^2}$ where $x > \frac{1}{x} > 0$.
- (A) $\sqrt{5}$ (B) $2\sqrt{5}$ (C) $3\sqrt{5}$ (D) $4\sqrt{5}$ (E) NOTA

25. Let W , X , Y , and Z be 2×2 matrices such that $\det(WXYZ) \neq 0$. If

$$W^{-1}XY = Z$$

then $X =$

- (A) ZWY^{-1} (B) $Y^{-1}WZ$ (C) WZY^{-1} (D) $ZY^{-1}W$ (E) NOTA
26. The number 28982 is called a *palindrome* because it reads the same forwards and backwards. What is the sum of the digits of the next largest palindrome?
- (A) 20 (B) 22 (C) 24 (D) 26 (E) NOTA
27. Consider the system of equations:

$$\begin{aligned} \log_{16}(a^2 + b^2) + \log_4(ab) &= 2010 \\ \text{and} \\ \log_4(a - b) + \log_{16}(a^2b^2) &= 2010 \end{aligned}$$

When a and b are real numbers where $a > b$, the system of equations is:

- (A) Always true (B) Sometimes true (C) Never true (D) Need more info (E) NOTA
28. For two continuous functions $f(x)$ and $g(x)$, $\lim_{x \rightarrow a}(f(x) + g(x)) = 7$ and $\lim_{x \rightarrow a}(f(x) - g(x)) = 3$. Compute the value of $\lim_{x \rightarrow a}(f(x)g(x))$.
- (A) 8 (B) 10 (C) 12 (D) 14 (E) NOTA
29. For integers a, b, c, d , let $x^3 = a(x + 1)^3 + b(x + 1)^2 + c(x + 1) + d$. Compute the value of $a + b + c + d$.
- (A) -2 (B) -1 (C) 1 (D) 2 (E) NOTA
30. The fraction $\frac{12}{x^2 + 2x + 3}$ can be written in the form $\frac{A}{x + 1} + \frac{B}{x + 2}$ where A and B are integers. Determine the value of AB .
- (A) -144 (B) 0 (C) 12 (D) 144 (E) NOTA