

Where applicable, "E) NOTA" indicates that none of the above answers is correct.

1. Solve for x in the system:
$$\begin{cases} 3x - y = 13 \\ y - x = 5 \end{cases}$$

- A) 7 B) 9 C) 11 D) 13 E) NOTA

2. The first, second, and last terms in an arithmetic series are -2 , 4 , and 172 , respectively. Find the sum of this series.

- A) 2550 B) 2465 C) 2380 D) 2295 E) NOTA

3. If $f(x) = \frac{2x-1}{1+2x}$, find the value of $f^{-1}(3)$.

- A) $-\frac{3}{4}$ B) $\frac{5}{7}$ C) -1 D) 2 E) NOTA

4. In the system
$$\begin{cases} x + y = z \\ y + z = w \\ z + w = x \\ w + x = y \end{cases}$$
, where w , x , y , and z are real numbers, evaluate $w + y$.

- A) $-\frac{1}{6}$ B) $\frac{2}{3}$ C) $\frac{5}{8}$ D) $-\frac{1}{4}$ E) NOTA

5. Twenty years ago, the ratio of Henry's age to Mary's age was $2:3$. Eight years from now, the ratio of Henry's age to Mary's age will be $10:13$. How old is Mary currently? All ages are given as a whole number of years.

- A) 83 B) 71 C) 62 D) 50 E) NOTA

6. Mo drove from his house to T-Mobile Park at a constant speed of 50 miles per hour. He drove from the park back to his house at a faster constant speed, making his average speed over the entire round trip 60 miles per hour. What was his return speed, in miles per hour?

- A) 68 B) 70 C) 72 D) 75 E) NOTA

7. Evaluate: $\prod_{n=1}^7 \left(1 + \frac{9}{n} + \frac{20}{n^2} \right)$

- A) 130,680 B) 261,360 C) 1,045,440 D) 3,136,320 E) NOTA

8. If $x_i = \frac{i}{101}$, evaluate $\sum_{i=0}^{101} \left(\frac{x_i^3}{1 - 3x_i + 3x_i^2} \right)$.

- A) 51 B) 100 C) 101 D) 151 E) NOTA

9. If $f(3x^2 + x) = 9x^4 + 6x^3 + 7x^2 + 2x + 1$, find the value of $f(23)$.

- A) 441 B) 484 C) 529 D) 576 E) NOTA

10. Only $\frac{1}{6}$ of my lazy class turned in their assignments on time at the beginning of the day, but once three more people in that class turned in their assignments at the end of the same day, $\frac{1}{4}$ of that class had turned in their assignments by the end of that day. How many students are in my lazy class?

- A) 18 B) 24 C) 42 D) 48 E) NOTA

11. Find the trace of the product: $\begin{bmatrix} 5 & 0 & 0 \\ 2 & 4 & 0 \\ 3 & 7 & 6 \end{bmatrix} \begin{bmatrix} -5 & 2 & 3 \\ 0 & -4 & 7 \\ 0 & 0 & -6 \end{bmatrix}$

- A) 15 B) -15 C) 24 D) -24 E) NOTA

12. Define a metafactorial $n!^*$ for positive integer n as $n!^* = n! \cdot (n-1)! \cdot (n-2)! \cdots 3! \cdot 2! \cdot 1!$. In how many consecutive zeros does $37!^*$ end?

- A) 126 B) 129 C) 139 D) 164 E) NOTA

13. One root of $f(x) = x^4 - 4x^3 - 5x^2 - 64x - 336$ is $x = -4i$. If a and b are the real roots of f , find the value of $\frac{a^2 + b^2}{2ab}$.

- A) 7 B) $\frac{64}{21}$ C) $-\frac{64}{21}$ D) $-\frac{29}{21}$ E) NOTA

14. Find the imaginary solution to the equation $x^2 - (1-i)x + (-6+2i) = 0$

- A) $3+i$ B) $-3+i$ C) $3-i$ D) $-3-i$ E) NOTA

15. For the ellipse with equation $201x^2 + 110\sqrt{3}xy + 91y^2 = 2304$, what is the distance from either of its vertices to the origin?

- A) 3 B) 5.5 C) 8 D) 10.5 E) NOTA

16. Find the sum of the integral values of x such that $3^{2x^3-x^2-13x-6} = 7^{2x^3-5x^2-23x-10}$.

- A) -2 B) 1 C) 3 D) $-\frac{5}{2}$ E) NOTA

17. A sequence of positive real numbers is both arithmetic and geometric, and not all of the terms of the sequence are equal. What is the maximum number of terms in the sequence?

- A) 2 B) 3 C) 6 D) there is no maximum number
E) NOTA

18. Find the radian value of $2\arcsin\left(\frac{\sqrt{6}}{3}\right) - \arcsin\left(\frac{1}{3}\right)$.

- A) $\frac{\pi}{3}$ B) $\frac{5\pi}{12}$ C) $\frac{7\pi}{12}$ D) $\frac{\pi}{2}$ E) NOTA

19. Find the distance between the two points of intersection of the line with equation $y = 3x - 7$ and the circle with equation $x^2 + y^2 - 4x + 2y - 15 = 0$.

- A) 4 B) $4\sqrt{5}$ C) 6 D) $6\sqrt{5}$ E) NOTA

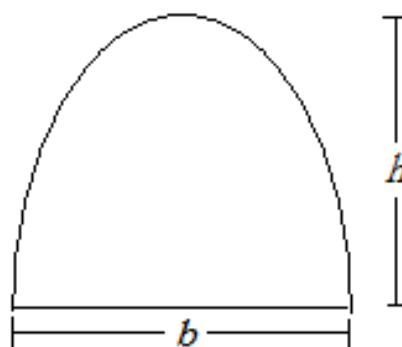
27. If $n \geq 2$ is an even integer, how many distinct real solutions does the equation $(\log x)^n = \log(x^n)$ have?

- A) 1 B) 3 C) $n-1$ D) n E) NOTA

28. If a , b , and c are complex numbers such that $a^2 + b^2 + c^2 = 15$, $a^3 + b^3 + c^3 = 31$, and $abc = 15$, find the possible value of $a + b + c$ that is positive.

- A) 7 B) 8 C) 9 D) 10 E) NOTA

29. Given a parabolic sector like the one shown, if b is the length of the segment across the bottom of the sector, perpendicular to the parabola's axis of symmetry, and h is the height of the sector from its vertex to this segment, the enclosed area A is given by the formula $A = \frac{2}{3}bh$. Given the quadratic equation



$5x^2 + bx + c = 0$, where b and c are real numbers in the interval $[0, 5]$, find the probability that the quadratic equation has one or two real solutions.

- A) $\frac{3}{5}$ B) $\frac{1}{5}$ C) $\frac{5}{8}$ D) $\frac{1}{12}$ E) NOTA

30. If $\lceil x \rceil$ is the least integer n satisfying $n \geq x$, find the sum: $\sum_{n=1}^{2026} \lceil \sqrt{2n+0.25} - 0.5 \rceil$

- A) 81,451 B) 83,216 C) 85,984 D) 87,642 E) NOTA