

- Please find the x -intercept of the perpendicular bisector of the segment that has endpoints at $(3, -5)$ and $(-1, 5)$.
 A) $-\frac{23}{2}$ B) 0 C) $\frac{2}{5}$ D) 1 E) NOTA
- The known roots of a cubic polynomial equation with relatively prime coefficients are -2 and $1+i$. Which of the following is the equation so described?
 A) $x^3 - 2x + 4 = 0$ B) $x^3 - 4x^2 + 6x - 4 = 0$
 C) $y^2 - 4y - 12x + 16 = 0$ D) $x^3 - 6x - 4 = 0$ E) NOTA
- A function P is defined as follows: $P(x) = \begin{cases} x^2 + 2, & x \leq -2 \\ \frac{x-1}{x+3}, & x > -2 \end{cases}$ Find the value of $(P \circ P)(-2)$.
 A) -2 B) $\frac{2}{5}$ C) $\frac{5}{9}$ D) undefined E) NOTA
- Find the solution of $\ln(5x) + \ln(2x) = 3$.
 A) $-\frac{13}{4}$ B) $\frac{e\sqrt{10e}}{10}$ C) $\pm \frac{e\sqrt{e}}{10}$ D) $\frac{e}{10}$ E) NOTA
- Find the coefficient of the linear term of the quadratic equation in which the greatest common factor of the coefficients equals 1, and which has a solution of $\frac{-3-i\sqrt{2}}{2}$.
 A) 12 B) 6 C) -6 D) -12 E) NOTA
- Solve for x : $\left(\frac{4}{9}\right)^{x-5} = \left(\frac{27}{8}\right)^{2x+1}$.
 A) $-\frac{13}{4}$ B) $\frac{1}{4}$ C) -2 D) $\frac{7}{8}$ E) NOTA
- Find the equation of the circle that is tangent to $y = -2$ and $y = 6$ and the y -axis, with center in quadrant II.
 A) $(x+4)^2 + (y+4)^2 = 16$ B) $(x+4)^2 + (y-2)^2 = 16$
 C) $(x-4)^2 + (y+2)^2 = 16$ D) $(x-2)^2 + (y+4)^2 = 16$ E) NOTA
- Find the equation of the parabola with vertex $(1, 2)$ and focus $(4, 2)$.
 A) $x^2 - 4x - 12y + 16 = 0$ B) $y^2 - 4y - 12x + 16 = 0$
 C) $(P \circ P)(-2)$ D) $y^2 - 4y + 12x + 16 = 0$ E) NOTA

9. Which of the following choices is a solution for x : $\begin{vmatrix} 0 & x & 1 \\ 3 & -1 & x \\ 4 & 0 & 1 \end{vmatrix} = 14$?
- A) 3 B) -2 C) -1 D) 4 E) NOTA
10. What is the maximum value of the function $f(x) = 2x^2 - 8x + 5$?
- A) 29 B) 21 C) 5 D) -3 E) NOTA
11. Given $x^3 - y^3 = 45$ and $x - y = 3$, find the value of xy .
- A) 4 B) 6 C) 8 D) 15 E) NOTA
12. Find the value of $x + y$ given $\begin{bmatrix} -2 & 3 \\ -1 & 4 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 11 \\ 12 \end{bmatrix}$.
- A) -1 B) 1 C) $-\frac{1}{2}$ D) $\frac{1}{2}$ E) NOTA
13. Find the solution of the inequality $\frac{x^3 + 2x^2 - 5x - 6}{x^3 - x^2 - 8x + 12} \geq 0$.
- A) $[-1, 2]$ B) $[-1, 2)$ C) $(-\infty, -3) \cup (-3, -1] \cup (2, \infty)$ D) $(-\infty, -1) \cup (2, \infty)$ E) NOTA
14. Jimmy correctly solved $2(4^x) + 6^x = 9^x$ and arrived at the solution $x = \log_{3/2}(h)$. Find the numerical value of h .
- A) 0.5 B) 0.66... C) 1.5 D) 2 E) NOTA
15. What is the sum of the coordinates of the point of intersection of the vertical and horizontal asymptotes of the function $f(x) = \frac{3x^2 + 7x - 6}{2x^2 + 5x - 3}$?
- A) 1 B) -3 C) $4/3$ D) 2 E) NOTA
16. Given $x = 27^{\log_3 4}$ and $y = 2^{-\frac{1}{2} \log_2 289}$, find the simplified value of $\frac{x}{y^{-1} - 1}$.
- A) $9/4$ B) 4 C) $3/4$ D) $4/3$ E) NOTA
17. Find the area of the region bounded by $|x| + |y| \leq 3$.
- A) 18 B) 27 C) 36 D) 54 E) NOTA

18. Express $1.\overline{327}$ as a fraction in simplest form. What is the sum of the numerator and denominator?
 A) 45 B) 73 C) 128 D) 256 E) NOTA
19. Jeff named the three roots of the equation $\sqrt[3]{2x^2 - 11x + 14} = 2 - x$ a , b , and c , and he stipulated that $a < b < c$. Find the value of $a^5 b^5 c^2$.
 A) 7,776 B) -972 C) -288 D) 324 E) NOTA
20. Solve the equation $\frac{x+7}{x^2-x-6} = \frac{A}{x-3} + \frac{B}{x+2}$ for A and B; what is the value of the expression $4B + 2A$?
 A) 4 B) 0 C) 6 D) 12 E) NOTA
21. What is the constant term in the expansion of $\left(\frac{2}{x} - 3x\right)^6$?
 A) 4,860 B) -2,160 C) -4,320 D) 729 E) NOTA
22. What is the domain of the function that is the inverse of $f(x) = \log_3(x - 2)$?
 A) $(2, \infty)$ B) $[2, \infty)$ C) $(-\infty, 2)$ D) $(-\infty, \infty)$ E) NOTA
23. Find the y-intercept of the slant asymptote of the function $f(x) = \frac{x^3 + 2x^2 + 4}{2x^2 + 1}$.
 A) 1 B) 0 C) 4 D) -2 E) NOTA
24. Find the coordinates of the vertices of the quadrilateral whose sides are contained in the following lines: $x = -2$, $y = -3x - 5$, $x - y = 5$, $3x + y = 3$.
 A) $(-2, -9)$, $(-2, -7)$, $(0, -5)$, $(2, -3)$ C) $(-2, 1)$, $(2, -3)$, $(-2, 9)$, $(0, -5)$
 B) $(-2, 1)$, $(0, -5)$, $(-2, -7)$, $(2, -3)$ D) $(-2, -3)$, $(0, -5)$, $(-2, 1)$, $(2, -3)$ E) NOTA
25. Given $a = \log_7 2$, $b = \log_7 3$, and $c = \log_7 5$, which expression below is equivalent to $\log_7 \frac{9!}{1715}$?
 A) $7a + 4b - 3$ B) $7a + 4b - 2$ C) $7a + 4b + c - 3$ D) $7a + 4b + c - 2$ E) NOTA
26. What is the point of intersection of the axis of symmetry and the directrix of the graph of $y^2 + 2y - 4x + 33 = 0$?
 A) $(7, -1)$ B) $(6, 8)$ C) $(7, 8)$ D) $(7, 1)$ E) NOTA

27. Let $A = \begin{vmatrix} \log_{125} 64 & \log_{49} 32 \\ \log_{1024} \frac{1}{49} & \log_{128} \frac{1}{5} \end{vmatrix}$. What is the simplified value of A ?

- A) 1 B) $-11/14$ C) $5/14$ D) $3/14$ E) NOTA

28. Given $i = \sqrt{-1}$, solve for X : $X = \sum_{k=0}^{2014} i^k$.

- A) 1 B) -1 C) i D) $-i$ E) NOTA

29. Given $a \diamond b = \frac{3a+2b}{2a-3b}$, and $x \diamond (4 \diamond 2) = 8$. Solve for x .

- A) 6 B) 8 C) 12 D) 16 E) NOTA

30. Solve for x : $\frac{2}{x} + \frac{3}{y} = 2$, $\frac{4}{x} - \frac{9}{y} = -1$.

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