

If no correct answer is given, choose E. NOTA

1. The coordinates of the vertex of the parabola defined by $f(x) = x^2 + 4x$ are

- A. (-4,-4) B. (-2,-4) C. (2,-4) D. (2,4) E. NOTA

2. $-2^4 + \sqrt{1024} + 3 + (-2)^4 \div 8 =$

- A. $\frac{35}{8}$ B. $\frac{67}{8}$ C. 21 D. 57 E. NOTA

3. Given $f(x) = a^x$ where a is a positive real number. Which of the following is/are true relative to the graph of $f(x)$?

- I. The graph has points in quadrants I and II.
II. The graph contains the point (0,1).
III. The graph has a horizontal asymptote.

- A. I only B. I and II only C. II and III only D. I, II, and III E. NOTA

4. Solve for x : $\frac{(x-2)(x+3)}{(x+5)} \geq 0$.

- A. $-5 \leq x \leq -3$ B. $-5 < x \leq -3$ or $x \geq 2$ C. $x < -5$ or $-3 \leq x \leq 2$
D. $x > -5$ E. NOTA

5. Consider positive numbers a , b , and c . $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 1$ if and only if

- A. $ac + bc + ab = abc$ B. $a + b + c = 9$ C. a , b , and c are each less than one
D. $a = b = c$ E. NOTA

6. A circle with radius 2 is inscribed in an ellipse with equation $x^2 + 4y^2 = 16$. What is the area, in square units, of the region which is inside the ellipse but outside the circle?

- A. 2π B. 4π C. 12π D. 16π E. NOTA

7. Which of the following has a value of 0?

A. ${}_nC_0$

B. ${}_nP_0$

C. $0!$

D. $\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix}$

E. NOTA

8. If $z = 12 + 9i$, where i is the imaginary unit, then $\sqrt{z\bar{z}} =$

A. $3\sqrt{7}$

B. $3\sqrt{7}i$

C. 15

D. $15i$

E. NOTA

9. If $n!$ ends in exactly three zeros and n is a perfect square, then n must be

A. 16

B. 25

C. 36

D. 49

E. NOTA

10. $(a + b)^6$ is expanded. Rather than combining like terms, all 64 terms are displayed. If one term is selected at random, what is the probability that the exponent of b is > 3 ?

A. $\frac{11}{32}$

B. $\frac{13}{32}$

C. $\frac{15}{32}$

D. $\frac{17}{32}$

E. NOTA

11. The value of $\log_2 5$ correct to the nearest tenthousandth is

A. 2.3217

B. 2.3218

C. 2.3219

D. 2.3220

E. NOTA

12. If a right circular double-napped cone is cut by a plane perpendicular to its axis, the intersection is a point or a

A. pair of intersecting lines

B. circle

C. parabola

D. hyperbola

E. NOTA

13. The graphs of $f(x) = \log x$ and $g(x) = 10^x$ are symmetric to each other with respect to

A. the point $(0,0)$

B. the X-axis

C. the Y-axis

D. the line $y = x$

E. NOTA

14. If $i = \sqrt{-1}$, then $(1 - i)^{20} =$

A. -1024

B. 1024

C. -1024i

D. 1024i

E. NOTA

15. The triangular numbers belong to the sequence 1, 3, 6, 10, 15, ... What is the 20th triangular number?

- A. 195 B. 200 C. 215 D. 220 E. NOTA

16. If $|x - 1| + |x + 3| = 4$, then

- A. $x = 1$ B. $x = -3$ C. $x = 1$ or $x = -3$ D. $-3 \leq x \leq 1$ E. NOTA

17. The sum of the arithmetic mean, the positive geometric mean, and the harmonic mean of 4 and 16 is

- A. 20.4 B. 24.4 C. 30.2 D. 36 E. NOTA

18. Snap can do a certain job in two hours. Crackle can do the same job in two hours. It takes Pop three hours to do that job. If they work together, with no time out for bickering, how long will the job take?

- A. 30 minutes B. 35 minutes C. 40 minutes D. 45 minutes E. NOTA

19. Given: $x + \frac{4}{y} = 1$ and $y + \frac{4}{x} = 25$. The sum of the two possible values of y is

- A. 0.8 B. 5.2 C. 20 D. 25 E. NOTA

20. If $f(x) = x^2$, then $\frac{f(x+h) - f(x)}{h} =$

- A. 1 B. h C. $x + h$ D. $2x + h$ E. NOTA

21. If the complex number $z = 5 - 12i$, then $|z| =$

- A. 7 B. 11 C. 13 D. 19 E. NOTA

22. $\frac{1}{1-\sqrt{2}} - \frac{1}{\sqrt{2}-\sqrt{3}} =$

- A. $-1 - \sqrt{3}$ B. $1 - \sqrt{3}$ C. $-1 + \sqrt{3}$ D. $1 + \sqrt{3}$ E. NOTA

23. A polynomial of degree p where p is a prime number > 2 has, at most n roots of the form $a + bi$ where b is not zero. The value of n is

- A. $\frac{p+1}{2}$ B. $p - 1$ C. p D. $p + 1$ E. NOTA

24. Which of the following is an odd function?

- A. $f(x) = |5x|$ B. $f(x) = 5x^2$ C. $f(x) = 2x^3$ D. $f(x) = \log_3 x$ E. NOTA

25. One factor of $x^4 + 4$ is

- A. x^2 B. $x^2 + 2$ C. $x^2 + 2x$ D. $x^2 + 2x + 2$ E. NOTA

26. The distance between the point $(1, 1)$ and the graph of $3x + 4y = 2$ is

- A. 1 B. 1.4 C. 1.8 D. 2 E. NOTA

27. Consider the quadratic equation written in the form $3x^2 + bx + c = 0$. If the roots of this equation are $\frac{2}{3}$ and $\frac{3}{2}$, then the value of b is

- A. -6.5 B. -2.16 C. -1 D. 1 E. NOTA

28. Suppose a , b , and c are real numbers. If $\sqrt[4]{a^2 b^8 c^4}$ is completely simplified over the set of real numbers, then the simplification is

- A. $b^2 c \sqrt{a}$ B. $b^2 |c| \sqrt{|a|}$ C. $b^2 c \sqrt[4]{a^2}$ D. $b^2 |c| \sqrt[4]{a^2}$ E. NOTA

29. The graphs of $y = 2^x$ and $y = x^2$ intersect in exactly

- A. one point B. two points C. three points D. four points E. NOTA

30. If $f(x) = \sqrt[3]{\frac{x+1}{x-2}}$, then $f^{-1}(x) =$

- A. $\frac{2x^3 - 1}{x^3 - 1}$ B. $\frac{2x^3 + 1}{x^3 - 1}$ C. $\frac{x^3 - 2}{x^3 + 1}$ D. $\left(\frac{x-2}{x+1}\right)^3$ E. NOTA