NOTA = None of these answers

1. What is the range of the relation $\{(-1, 2), (0,0), (1,2)\}$?

A) $\{-1, 0, 1\}$        B) $\{-1, 0, 1, 2\}$     C) $\{0, 2\}$             D) $\{-2, 0, 2\}$          E) NOTA

2. Which values of x are not in the domain of $g(x) = \dfrac{1}{3-|x|}$?

A) 0, 3          B) -3, 3          C) 0, $\dfrac{1}{3}$          D) $\dfrac{-1}{3}, \dfrac{1}{3}$          E) NOTA

3. Which point is a vertex of the solution region of the system of inequalities $|y| \leq 2$ and $-3 \leq 2x - y \leq 2$?

A) (-2, 2)          B) (0, 0)          C) (2, 0)          D) (0, -2)          E) NOTA

4. When the expression $\dfrac{x+y}{x^{-1}+y^{-1}}$ is simplified the result is:

A) $(x + y)^2$          B) xy          C) $\dfrac{1}{xy}$          D) $x^2 + y^2$          E) NOTA

5. One of the factors of $2x^3 - 7x^2 + 2x + 3$ is $x - 3$. What is another factor of $2x^3 - 7x^2 + 2x + 3$?

A) x + 3          B) x + 1          C) 2x - 1          D) x - 1          E) NOTA

6. What is the multiplicity of the root $x = -2$ satisfying the equation $x^4 - 8x^2 + 16 = 0$?

A) 0          B) 1          C) 2          D) 4          E) NOTA

7. If $f(t) = \dfrac{1+t}{t}$, then which of the following also is equivalent to f(t)?

A) f(-t)          B) $f\left(\dfrac{1}{t}\right)$          C) $f\left(\dfrac{-1}{t}\right)$          D) $\dfrac{1}{t}f\left(\dfrac{1}{t}\right)$          E) NOTA

8. If for a certain base b, $\log_b 2 = x$ and $\log_b 10 = y$ then $\log_b 250$ equals what?

A) -2x + 3y          B) -3x + 2y          C) 2x + 3y          D) 3x + 2y          E) NOTA

9. According to Descartes Rule of Signs, the polynomial $f(x) = 2x^5 - x^3 - x - 1$ has at most how many negative real zeros?

A) 5          B) 4          C) 2          D) 0          E) NOTA

NOTA = None of these answers

10. If Cramer's Rule is used to solve for x in the following system and $3y=-2x + 4$ and $y = .5x - 1$

$x = \dfrac{N}{\begin{vmatrix} 2 & 3 \\ -1 & 2 \end{vmatrix}}$, what is the value of N?

A) 2          B) - 14          C) 21          D) 7          E) NOTA

11. Given matrices $P = \begin{bmatrix} 4 & -6 \\ 1 & 3 \end{bmatrix}$ and $Q = \begin{bmatrix} -1 & 7 \\ 2 & -2 \end{bmatrix}$ which expression represents the

matrix $\begin{bmatrix} 5 & 9 \\ 8 & 0 \end{bmatrix}$?

A) $3P + Q$          B) $2P - 3Q$          C) $2P - Q$          D) $2P + 3Q$          E) NOTA

12. If P is a 2 by 2 matrix such that its determinant does not equal zero, which of the following is $P^{-1} \cdot P$?

A) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$          B) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$          C) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$          D) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$          E) NOTA

13. For what value of n does $S_n = 1250$ for the arithmetic series: $2 + 6 + 10 + 14 + \ldots$?

A) 74          B) 98          C) 18          D) 25          E) NOTA

14. The first term of a geometric series is $\dfrac{1}{12}$. The fourth term is $\dfrac{-9}{4}$. What is the common ratio?

A) $\dfrac{-7}{12}$          B) $\dfrac{-1}{27}$          C) -3          D) -4          E) NOTA

15. The lines $y = 2x + 1$ and $y = 2x + 4$ are parallel. What is the perpendicular distance between the two lines?

A) 3          B) $\dfrac{3\sqrt{5}}{5}$          C) $\sqrt{2}$          D) $\dfrac{\sqrt{29}}{3}$          E) NOTA

16. Which of the following is equivalent to the arithmetic series: $4 + 8 + 12 + \ldots$?

A) $\sum\limits_{n=1}^{\infty}(4+n)$          B) $\sum\limits_{k=1}^{3}4k$          C) $\sum\limits_{p=1}^{\infty}4^p$          D) $\sum\limits_{b=1}^{\infty}4b$          E) NOTA

17. If $f(x) = 3x - 4$ and $g(x) = 2x^3 + 1$, what is $(g \circ f)(x)$?

A) $27x^3-108x^2+144x-64$          B) $27x^3-108x^2+144x-63$          C) $54x^3-216x^2+288x-127$
D) $54x^3-216x^2+288x-128$          E) NOTA

NOTA = None of these answers

18. Given $f(x) = \dfrac{x+2}{x+1}, x \neq -1$, what is $f^{-1}(x)$?

A) $\dfrac{x+1}{x+2}$
B) $\dfrac{x-2}{1-x}$
C) $\dfrac{x+2}{1-x}$
D) $\dfrac{x-2}{x+1}$
E) NOTA

19. Given: $a \neq 0$. A triangle with vertices $(-a, 0)$, $(0, \sqrt{3}a)$, $(a, 0)$ is what kind of triangle?

A) right
B) equilateral
C) scalene
D) obtuse
E) NOTA

20. What is the focus of the parabola $(x - 6)^2 = 8(y + 1)$?

A) $(6, -1)$
B) $(1, 7)$
C) $(6, 1)$
D) $(-2, -6)$
E) NOTA

21. What is the sum of the major axis, minor axis and the focal length of the ellipse
$4x^2 + 9y^2 + 16x + 18y - 11 = 0$?

A) $10 + 2\sqrt{5}$
B) $10$
C) $5 + 2\sqrt{5}$
D) $10 + \sqrt{5}$
E) NOTA

22. What is the eccentricity of the ellipse that has a minor axis of length $2\sqrt{21}$ and foci $(2, 3)$ and $(2, -1)$?

A) $\dfrac{3}{5}$
B) $\dfrac{2}{10}$
C) $\dfrac{2}{5}$
D) $\dfrac{10}{3}$
E) NOTA

23. Which of the following is the equation of an equilateral hyperbola with foci $(\sqrt{6},0)$ and $(-\sqrt{6},0)$?

A) $\dfrac{x^2}{6} - \dfrac{y^2}{6} = 1$
B) $\dfrac{x^2}{3} - \dfrac{y^2}{3} = 1$
C) $\dfrac{y^2}{6} - \dfrac{x^2}{6} = 1$
D) $\dfrac{y^2}{9} - \dfrac{x^2}{9} = 1$
E) NOTA

24. How many ways can six people be seated at a circular table relative to each other?

A) 64
B) 120
C) 384
D) 720
E) NOTA

25. What is the number of possible distinct arrangements of the letters of the word *banana*?

A) 60
B) 720
C) 144
D) 180
E) NOTA

26. The probability that an event will occur is $\dfrac{a}{b}$. What are the odds for the event occurring?

A) $a : b-a$
B) $a : a-b$
C) $a : a+b$
D) $b-a : a+b$
E) NOTA

NOTA = None of these answers

27. Six numbers from a list of nine integers are 7, 8, 3, 5, 9, and 5.  The largest possible value of the median of all nine numbers in this list is what?

A) 5              B) 6              C) 7              D) 8              E) NOTA

28. The logistic equation $H = \dfrac{A}{1+Be^{-rt}}$ can be used to estimate the height H of a tree after t years of growth where A, B, and R are positive constants.  To determine the number of years it takes a tree to reach a certain height, you must solve the logistics equation for t.  Which of the following is the correct formula for t?

A) $t = \left(\dfrac{1}{r}\right)(\ln H + \ln B - \ln(A-H))$     B) $t = \left(\dfrac{1}{r}\right)(\ln(A-H) - \ln(HB))$

C) $t = \left(\dfrac{1}{r}\right)(\ln H + \ln B - \ln A)$     D) $t = \left(\dfrac{1}{r}\right)(2\ln H + \ln B - \ln A)$     E) NOTA

29. What is the length of the shorter side of a rectangle with an area of 6 and a perimeter of $6\sqrt{3}$ ?

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

30. $f(x) = x^3 + a_1x^2 + a_2x + a_3$.  Suppose $f(x_1)$ is positive and $f(x_2)$ is negative.  If n is the number of real zeros between $x_1$ and $x_2$, which is true of n?

A) $1 \le n \le 3$       B) n < 3       C) n = 3       D) n = 1       E) NOTA

31. Which of the following relations has an inverse that is a function?

   $f(x) = \sqrt{x}$          $g(x) = 2^x$          $h(x) = \dfrac{1}{x+1}$

A) g(x) only     B) f(x) and g(x) only     C) f(x) and h(x) only     D) all of them     E) NOTA

32. A chemical firm receives an order for 50 liters of 34% hydrochloric acid solution.  They have on hand three different concentrations of hydrochloric acid:  a 10% solution (A), a 30% solution (B), and a 50% solution (C).  Because of the quantities of each solution available, the firm decides it must use some of each solution in the stock and they want to use twice as much of solution B as a solution C.  How many liters of each solution should be used to fill the order?

A) 20 liters of A, 20 liters of B, and 10 liters of C    B)14 liters of A, 24 liters of B, and 12 liters of C
C) 10 liters of A, 30 liters of B, and 15 liters of C    D) 5 liters of A, 30 liters of B, and 15 liters of C
E) NOTA

NOTA = None of these answers

33. If a car drives one mile at x miles per hour and then one mile at y miles per hour, which expression represents the average speed of the car over the two miles?

A) $\dfrac{x+y}{2}$ mph     B) $2\left(\dfrac{1}{x}+\dfrac{1}{y}\right)$ mph     C) $\dfrac{2xy}{x+y}$ mph     D) $\dfrac{2x+2y}{3}$ mph     E) NOTA

34. Find the sum of the coefficients in the expansion of $(2a + b - c)^8$.

A) 720          B) 256          C) 676          D) 512          E) NOTA

35. If $f(x) = x^{(x+1)}(x+2)^{(x+3)}$ then $f(0) + f(-1) + f(-2) + f(-3)$ equals what?

A) $\dfrac{-8}{9}$          B) 0          C) $\dfrac{8}{9}$          D) 1          E) NOTA

36. If # is an operation of positive real numbers, for which of the following definitions of # is r # s = s # r (commutative property) for all nonzero r and s ?

A) r # s = r − s     B) r # s = $\dfrac{r}{s}$     C) r # s = $r^2 s$     D) r # s = $\dfrac{r+s}{rs}$     E) NOTA

37. Consider the number $144_b$, which is written to the base b, b is a positive integer. For what values of b is the number a perfect square?

A) b > 4          B) b > 5          C) b > 0          D) b > 2          E) NOTA

38. If the radius of a sphere is doubled, the percent of increase in volume is

A) 100          B) 200          C) 700          D) 800          E) NOTA

39. If log x $\geq$ log 2 + $\dfrac{1}{2}$ log x, then

A) x $\geq$ 2          B) x $\geq$ 4          C) x $\leq$ 2          D) x $\leq$ 4          E) NOTA

40. A ladder 85 ft long is leaning against a building, and reaches a window ledge 75 ft. high. How many feet must the bottom of the ladder be moved away from the building so that the top of the ladder will reach a ledge 7 ft. lower?

A) 9          B) 10          C) 11          D) 12          E) NOTA

NOTA = None of these answers