"NOTA" stands for "None of the Above."

1. How many integers x satisfy the inequality $|3x-2| < 20$?

    A. 12   B. 13   C. 14   D. 15   E. NOTA

2. If $f(x) = \dfrac{x+1}{x-4}$ and $g(x) = \dfrac{x-1}{x-2}$, then what is $f(g(3))$?

    A. $-3/2$ B. $-5/6$ C. $5/6$ D. $3/2$ E. NOTA

3. If $144 = 2^{x-y} \cdot 3^{x+y}$, then what is $x \cdot y$?

    A. -6 B. -3 C. 3   D. 6   E. NOTA

4. If $f(x) = \dfrac{x}{3x+4}$, then what is $f^{-1}(x)$?

    A. $\dfrac{3x}{1-4x}$ B. $\dfrac{3x}{4x-1}$ C. $\dfrac{4x}{1-3x}$ D. $\dfrac{4x}{3x-1}$ E. NOTA

5. Find $A - B$ if $\dfrac{2x+11}{x^2+x-2} = \dfrac{A}{x-1} + \dfrac{B}{x+2}$.

    A. -2 B. $-20/3$ C. $20/3$ D. 2   E. NOTA

6. Find the area of the region bounded by the lines $y = 3x$, $y = \frac{1}{2}x$, and $y = -2x + 10$.

    A. 5   B. 10   C. 15   D. 20   E. NOTA

7. When plotted, the equation $x^2 - x - y^2 - y = 0$ is two lines intersecting at the point (a,b). Compute $a \cdot b$.

    A. $-1/2$ B. $-1/4$ C. $1/4$ D. $1/2$ E. NOTA

8. Find the solution set: $\dfrac{z+3}{z-3} < 3$.

    A. $(6,\infty)$ B. $(-\infty,3) \cup (3,\infty)$ C. $(3,6)$ D. $(-\infty,3) \cup (6,\infty)$ E. NOTA

9. Find the sum of the values of x for which the vectors $\langle x+3, x-3 \rangle$ and $\langle x-3, x+1 \rangle$ perpendicular?

   A. -2 B. 1   C. 3   D. 5   E. NOTA

10. How many real solutions does $x^4 - 2x^3 + 2x^2 - 2x + 1 = 0$ have?

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

11. Billy wants to build a rectangular enclosure in his yard, using his wall as one of the sides and fencing for the other three sides. He has 100 feet of fencing available. What is the maximum area in square feet that his fence can cover?

   A. 1200 sq. ft.   B. 1250 sq. ft.   C. 1875 sq. ft.   D. 2500 sq. ft.   E. NOTA

12. The polynomial $f(x) = x^2 - 12x + c$ has two real roots, one of which is the square of the other. Find the sum of all possible values of c.

   A. -37 B. -12 C. 25   D. 91   E. NOTA

13. What is the horizontal asymptote of $f(x) = -\dfrac{4x^2 + 3x + 3}{3x^2 - x + 1}$?

   A. $y = -3$ B. $y = -4/3$ C. $y = 4/3$ D. $y = 3$ E. NOTA

14. Two sides of a triangle have lengths 10 and 20. How many integers can take the value of the third side length?

   A. 18   B. 19   C. 20   D. 21   E. NOTA

15. Find the shortest distance between the point $(4, 3)$ and the circle $x^2 + y^2 = 4$.

   A. 3   B. 5   C. 11   D. 14   E. NOTA

16. For what value of c is the constant term of $\left(x\sqrt{2} + \dfrac{\sqrt{c}}{x^2} \right)^6$ equal to 120?

   A. 1   B. 2   C. 3   D. 4   E. NOTA

17. If $x + \dfrac{1}{x} = 3$, then what is $x^5 + \dfrac{1}{x^5}$?

    A. 123   B. 144   C. 159   D. 186   E. NOTA

18. Find the product of the values of x for which the matrix $\begin{bmatrix} 1 & x & -1 \\ x & 0 & x \\ x & 1 & x \end{bmatrix}$ has determinant 1.

    A. $-1/4$ B. $1/4$ C. $-1/2$ D. $1/2$ E. NOTA

19. Solve for y: $-y - 10 < 3y + 6 \le 4y - 2$.

    A. $-4 < y \le 8$ B. $y > 8$ C. $y > 4$ D. $y \ge -4$ E. NOTA

20. Bob is currently 4 times as old as Ann. In 8 years, Ann will be half of Bob's age. What is the sum of their current ages?

    A. 8   B. 12   C. 16   D. 20   E. NOTA

21. Solve for m: $\sqrt{m + \sqrt{m + \sqrt{m + \cdots}}} = 10$.

    A. 80   B. 90   C. 100   D. 110   E. NOTA

22. What is the interval of solutions to the equation $x^4 - x^3 - 21x^2 + x + 20 \le 0$?

    A. $(-\infty, -4) \cup (-1, 1) \cup (5, \infty)$ B. $(-\infty, -4] \cup [-1, 1] \cup [5, \infty)$

    C. $(-4, -1) \cup (1, 5)$ D. $[-4, -1] \cup [1, 5]$ E. NOTA

23. If $f(3x - 5) = x^4 + x^3 - 3x + 7$, then what is the sum of the coefficients of $f(x)$?

    A. 4   B. 6   C. 21   D. 25   E. NOTA

24. If $f(4x + 8) = 2x^3 + 2x^2 - 3x + 5$, then what is the constant term of $f(x)$?

    A. 3   B. 5   C. 6   D. 23   E. NOTA

25. What is the maximum value of $f(x) = \sin(x) + 2\cos(x)$?

    A. $\sqrt{3}$ B. $\sqrt{5}$ C. 3   D. 5   E. NOTA

26. What is the value of n if $2^0 + 2^1 + 2^2 + \cdots 2^n = 1023$?

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

27. If $f(3x) = x + 2$, then what is $f^{-1}(5)$?

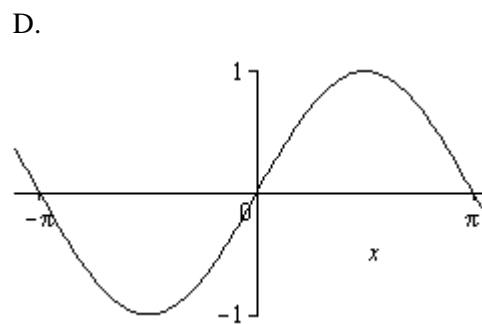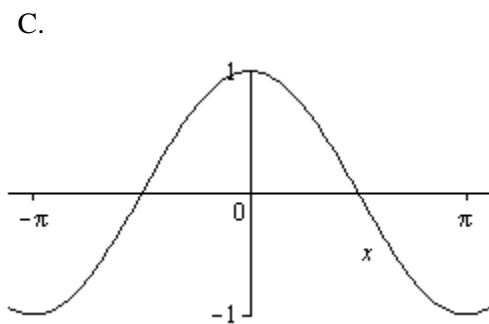   A. 3   B. 9   C. $3/5$ D. $5/3$ E. NOTA
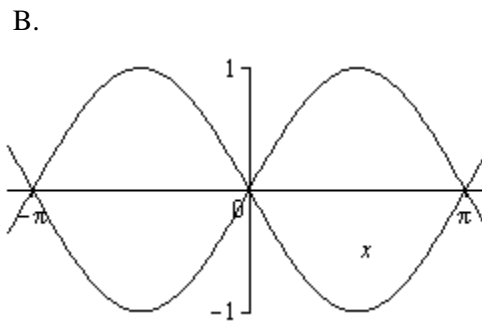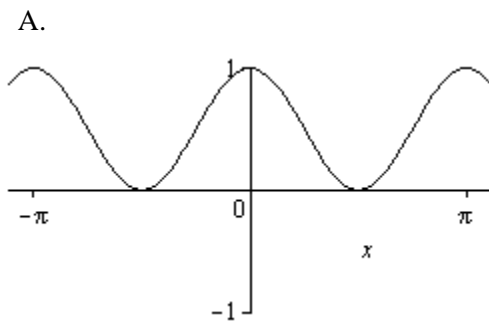
28. What is the domain of the function $f(x) = \sqrt{\ln x}$?

    A. $[0, \infty)$ B. $[1/e, \infty)$ C. $[1, \infty)$ D. $[e, \infty)$ E. NOTA

29. The line $y = k \cdot x$ is tangent to the parabola $y = x^2 - x + 16$ for two values of k. Find the sum of these two values.

    A. -2 B. 0   C. 2   D. 4   E. NOTA

30. Which figure shows the plot for the curve $1 = \sin^2 x + y^2$?

    A.

    B.

    C.

    D.

    E. NOTA