1. Find the sum of the real solutions of the equation $x^3 - 2x^2 - 11x + 22 = 42$?

   A. -5 B. 0 C. 2 D. 5 E. NOTA

2. If $x - y = 6$ and $x^2 + y^2 = 22$, then what is the value of $\frac{1}{x} - \frac{1}{y}$?

   A. 0 B. $\frac{1}{2}$ C. $\frac{4}{5}$ D. $\frac{6}{7}$ E. NOTA

3. Find the sum of the roots of $3^{2x+1} - (10)3^x + 3 = 0$

   A. 0 B. 1 C. 3/2 D. 5/3 E. NOTA

4. How many asymptotes does the graph of $g(x)$ given that $g(x) = \frac{x^3+2x^2-5x-6}{x^3+2x^2-9x-18}$?

   A. 0 B. 1 C. 2 D. 3 E. NOTA

5. Given that $x^{10} + x^9 + x^8 + x^7 + x^6 + x^5 + x^4 + x^3 + x^2 + x + 1 = 0$ have roots $x_1, x_2, x_3, \ldots, x_9, x_{10}$, find the sum of ${x_1}^{11} + {x_2}^{11} + {x_3}^{11} + \cdots + {x_9}^{11} + {x_{10}}^{11}$.

   A. 10 B. 11 C. -1 D. -10 E. NOTA

6. $x = \sqrt{4 + 3\sqrt{4 + 3\sqrt{4 + \cdots}}}$ Find x.

   A. 5 B. $4, -1$ C. 4 D. 3 E. NOTA

7. What is the graph of $9x^2 - 126x + 4y^2 + 32y = -505$?

   A. Two lines B. Ellipse C. Hyperbola D. Point E. NOTA

8. Find the remainder when $x^5 - 4x^4 + x^2 + 1$ is divided by $x - 3$.

A. -71 B. -70 C. 65 D. 71 E. NOTA

9. Find the solutions of $\frac{x^3-13x^2+54x-72}{x-3} = 3$.

A. 7, 3 B. 7 C. 0 D. 6, 4 E. NOTA

10. Two secant lines are drawn from point C to the same circle. One line intersects the circle at points B and A. The other intersects the circle at points D and E. If $CB = x + 3$, $CA = 2x + 4, CD = 2x$, and $CE = x + 8$. Find x.

A. 2 B. 3 C. 4 D. 6 E. NOTA

11. Sean the sheep needs to find water. He starts at the point $(6, 4)$ on the coordinate plane. He will go to the river at line $y = 2$. However, he needs to go to his enclosure after drinking water at the river. His enclosure is at the point $(-9, 8)$. What is the length of the shortest path Sean can take to go to the river and then his enclosure?

A. 16 B. 17 C. 18 D. 23 E. NOTA

12. Express the solution of $\frac{x^3-2x^2-7x-4}{x+5} \geq 0$ in interval notation.

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

13. Find the length of the latus rectum of the conic: $4x^2 - 24x + 9y^2 - 144y = -576$.

A. 4/3 B. 8/3 C. 3 D. 2 E. NOTA

14. Find the area of the region bound by the following inequalities:

$$y \geq x, y \leq 3x + 2, y \leq -2x + 12$$

A. 20 B. 30 C. 15 D. 12 E. NOTA

15. Farmer Payne sees 37 heads and counts 245 legs on his farm, Farmer Payne has cows, which have 8 legs, and chickens, which have 5 legs. If each cow has one head and each chicken has one head, how many cows are there?

A. 20 B. 17 C. 15 D. 22 E. NOTA

16. Find the number of ordered pairs of positive integers (x, y) such that $5x + 13y = 286$.

A. 3 B. 4 C. 5 D. 6 E. NOTA

17. Evaluate

$$\sum_{n=1}^{n=999} \log_{10} \frac{n+1}{n}$$

A. 2.7 B. 2 C. 4 D. 3 E. NOTA

18. Given a fourth-degree polynomial $f(x)$ where $f(1) = 3, f(2) = 15, f(3) = 29,$ $f(4) = 55, f(5) = 105$, find $f(6)$.

A. 2 B. 193 C. 175 D. 38 E. NOTA

19. If $x + \frac{1}{x} = 3$, find $x^6 + \frac{1}{x^6}$.

A. 7 B. 18 C. 322 D. 324 E. NOTA

20. What is the maximum value of the function $f(x) = -3x^2 - 12x + 12$?

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

21. Find the distance between the foci of the conic $25x^2 - 150x - 36y^2 - 72y = 711$.

A. $\sqrt{61}$ B. $2\sqrt{61}$ C. 14 D. 16 E. NOTA

22. Two infinite geometric sequences have the same sum. One starts with $3a$ and has a common ratio r, and another starts with a and has common ratio $2r$. What is r given a is not 0?

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

23. Given $f(x) = 5x^5 + 3x^4 - ax^3 - bx^2 + 117$ for positive integers a, b. What is the maximum number of negative roots of $f(x)$?

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

24. If A varies jointly with the square of B and the cube root of C, and A is 6 when B is 3 and C is 8. What is A when B is 2 and c is 27?

A. 4 B. 27/2 C. 6 D. 3 E. NOTA

25. Compute

$$\sum_{n=1}^{n=100} \frac{1}{n^2 + 3n + 2}$$

A. 100/101 B. 25/51 C. 1/2 D. 50/101 E. NOTA

26. If the roots of the following equation are sides of a cyclic quadrilateral, find the area of the quadrilateral: $x^4 - 16x^3 + 91x^2 - 216x + 180$?

A. 10 B. $3\sqrt{5}$ C. $4\sqrt{3}$ D. $6\sqrt{5}$ E. NOTA

27. An acute triangle has sides of length 90, 108, and x. Which of the following is a possible value of x?

A. 36 B. 54 C. 144 D. 180 E. NOTA

28. Iris is trying to make a cleaning solution. If she already has 12 liters of a mixture containing 75% chlorine and 25% water, how much water must be added to get a mixture containing 20% chlorine?

A. 32 B. 12 C. 30 D. 27 E. NOTA

29. Find the sum of the coefficients in the expression of $(2w + 3x - y - 3z)^{12}$?

A. 2 B. 1 C. 3 D. 4096 E. NOTA

30. Find the area of the following conic: $4x^2 - 48x + 9y^2 - 126y = -549$?

A. 36π B. 6 C. 6π D. 36 E. NOTA