Answer “E” will be “NOTA” meaning none of the above answers is correct.

1. Find the 4th term of \((3x + 2)^7\), where terms are written in descending order by power of \(x\).
   a. 840\(x^4\)   b. 2923\(x^4\)   c. 22680\(x^4\)   d. 210\(x^3\)   e. NOTA

2. Find “r” such that when \(x^3 + (r - 1)x + 3\) is divided by \((x + 1)\) the remainder will be 5.
   a. -2   b. -1   c. 3   d. 4   e. NOTA

3. \(\frac{2 - 2i}{3 + 4i} = ?\)
   a. \(\frac{8\sqrt{5}}{25}\)   b. \(\frac{8\sqrt{5}i}{25}\)   c. \(\frac{2 + 14i}{25}\)   d. \(\frac{2\sqrt{2}}{5}\)   e. NOTA

4. Six distinct integers are selected at random from \(\{2015, 2016, 2017, ..., 2024\}\). What is the probability that, among those selected, the second smallest is 2017?
   a. \(\frac{1}{60}\)   b. \(\frac{1}{6}\)   c. \(\frac{1}{3}\)   d. \(\frac{1}{2}\)   e. NOTA

5. Benji the Bug starts at a point \((x, y)\) on the graph of \(4x^2 + 9y^2 = 36\). He walks in a straight line to the point \((\sqrt{5}, 0)\), then in a straight line to the point \((-\sqrt{5}, 0)\), then in a straight line to his original starting point. How far has Benji walked?
   a. \(6 + 2\sqrt{5}\)   b. \(8 + 2\sqrt{5}\)   c. \(10 + 2\sqrt{5}\)   d. \(12 + 2\sqrt{5}\)   e. NOTA

6. The following sequence is a quadratic sequence where any nth term can be represented by \(a_n = An^2 + Bn + C\) \(1, 6, 17, 34, 57, ...\) What is the value of \(A - B + C\)?
   a. -2   b. -1   c. 3   d. 9   e. NOTA

7. \(\lim_{n \to \infty} \frac{3}{n^2} \left(2 + 4 + 6 + ... + 2n\right) = ?\)
   a. 2   b. 3   c. 4   d. 6   e. NOTA
8. \[ \sum_{k=3}^{\infty} \frac{8}{(k+2)(k-2)} = ? \]
   a. \( \frac{23}{6} \)  
   b. \( \frac{-23}{6} \)  
   c. \( \frac{25}{6} \)  
   d. \( \frac{-25}{6} \)  
   e. NOTA

9. If \( m \) and \( n \) are integers such that \( x^2 - x - 1 \) is a factor of \( mx^3 + nx^2 + 1 \), then \( n = ? \)
   a. -2  
   b. -1  
   c. 0  
   d. 2  
   e. NOTA

10. Simplify: \[ \frac{(x^2-4y^2+4y-1)(x+2y)}{(x^2-x-4y^2+2y)(x^2+2y+x-4y^2)} \]
    a. \( x+2y \)  
    b. \( \frac{x+2y}{2} \)  
    c. \( \frac{1}{(x-2y)(x+2y)} \)  
    d. \( \frac{1}{x-2y} \)  
    e. NOTA

11. A 4 liter solution is \( X\% \) acid. If \( \frac{4}{3} \) liters of pure acid are added to this solution, the new solution becomes \( (X+20)\% \) acid. What percent of the new solution is pure acid?
    a. 20  
    b. 40  
    c. 85  
    d. Not possible  
    e. NOTA

12. Given matrix \( A = \begin{pmatrix} -3 & -4 \\ 7 & 9 \end{pmatrix} \) Find the value of \[ \left[ \det(A^{-1}) + \text{the first row, second column entry of } A^{-1} \right] \].
    a. -57  
    b. -50  
    c. -6  
    d. 5  
    e. NOTA

13. Find the sum of the solutions for the following equation: \( 9^{x-1} - 3^{x-1} - 2 = 0 \)
    a. \( \emptyset \)  
    b. \( \log_3 6 \)  
    c. \( \log_6 3 \)  
    d. \( \log_6 6 \)  
    e. NOTA

14. The number of solutions to \( \{L,U\} \subseteq X \subseteq \{M,R,Z,L,U\} \), where \( X \) is a set, is?
    a. 2  
    b. 4  
    c. 6  
    d. 8  
    e. NOTA
15. Find the length of the latus rectum of: \( y^2 - 16x - 4y - 60 = 0 \)
   a. \( \frac{1}{4} \)  
   b. \( \frac{1}{16} \)  
   c. 8  
   d. 32  
   e. NOTA

16. What is the sum of an infinite geometric series in which the 1st term is 1 and the common ratio is \(-\sqrt{2}\) ?
   a. Undefined  
   b. \( \sqrt{2} - 1 \)  
   c. \( \sqrt{2} + 1 \)  
   d. \( \frac{\sqrt{2}}{2} \)  
   e. NOTA

17. Describe the steps of: \( f(x) = \frac{1}{2}[3x] \), where \([ \ ]\) represents the greatest integer function.
   a. \( \frac{1}{2} \) unit apart vertically, 3 units long  
   b. 3 units apart vertically, 2 units long  
   c. \( \frac{1}{2} \) unit apart vertically, \( \frac{1}{3} \) units long  
   d. 2 units apart vertically, 3 units long  
   e. NOTA

18. Given polynomial \( P(x) = x^4 + ax^3 + bx^2 + c \). If \( P(2) = 1 \), \( P(3) = 11 \), and \( P \) is an even function, then what is the value of \( a + b + c \) ?
   a. 11  
   b. 18  
   c. 22  
   d. 25  
   e. NOTA

19. If \( \frac{4 + 4^2 + 4^3 + \ldots + 4^{10}}{4^{-1} + 4^{-2} + 4^{-3} + \ldots + 4^{-10}} = 4^n \) then \( n = ? \)
   a. 0  
   b. 1  
   c. 10  
   d. 11  
   e. NOTA

20. What is the domain of \( y = \log \left( \frac{1}{\sqrt{x^2 - 4}} \right) \) ?
   a. \( (-\infty, -2] \cup [2, \infty) \)  
   b. \( (-\infty, -2) \cup (2, \infty) \)  
   c. \( [2, \infty) \)  
   d. \( (2, \infty) \)  
   e. NOTA

21. If \( \sin x = \frac{2}{5} \) and \( \sin 3x = \frac{L}{U} \) where \( L \) and \( U \) are relatively prime positive integers, what is \( |L - U| = ? \)
   a. 3  
   b. 5  
   c. 7  
   d. 9  
   e. NOTA
22. Determine which of the following angles is supplementary to 2.1 (round to two decimals).
   a. 167.90°  b. 168.10°  c. 1.04  d. 4.18  e. NOTA

23. \[ \sin\left(\sin^{-1}\left(\frac{3}{5}\right) - \cos^{-1}\left(\frac{12}{13}\right)\right) = ? \]
   a. \(-\frac{33}{65}\)  b. \(\frac{16}{65}\)  c. \(\frac{56}{65}\)  d. \(\frac{36}{65}\)  e. NOTA

24. Suppose for the state of Florida in any 5-year period the probability of a major hurricane is .25, the probability of a major freeze is .44, and the probability of both a major hurricane and a major freeze is .22. What is the probability of a major freeze given that there is a major hurricane (round to two decimals)?
   a. 0.47  b. 0.50  c. 0.69  d. 0.88  e. NOTA

25. A piece of beef jerky is located at (12,10). Buffy is at (4,-2) and is running up the line \( y = -5x + 18 \). At the point \((k, n)\) Buffy starts getting farther from the beef jerky rather than closer to it. What is \(k + n\)?
   a. 6  b. 10  c. 14  d. 18  e. NOTA

26. For what value of \(k\) is \[ i + 2i^2 + 3i^3 + \ldots + ki^k = 48 + 49i \]?
   a. 48  b. 49  c. 97  d. 98  e. NOTA

27. If \[ |L| + L + U = 10 \]
   \[ L + |U| - U = 12 \]
   what does \(L + U = ?\)
   a. -2  b. \(\frac{18}{5}\)  c. \(\frac{22}{3}\)  d. 22  e. NOTA

28. If \( \sin x + \sin y = \frac{\sqrt{15}}{3} \) and \( \cos x + \cos y = 1 \), what is \( \cos(x-y) \)?
   a. \(\frac{1}{3}\)  b. \(\frac{1}{2}\)  c. \(\frac{2}{3}\)  d. 1  e. NOTA
29. The perimeter of an equilateral triangle is numerically equivalent to the area enclosed by its circumscribed circle. What is the diameter of the circle?

a. \( \frac{6\sqrt{2}}{\pi} \)  

b. \( \frac{6\sqrt{3}}{\pi} \)  

c. \( \frac{12}{\pi} \)  

d. \( 2\pi\sqrt{3} \)  

e. NOTA

30. Find the distance between the points with polar coordinates: \( (3, \frac{5\pi}{6}) \) and \( (5, \frac{5\pi}{3}) \).

a. \( \sqrt{34 + 15\sqrt{3}} \)  

b. \( \sqrt{34 - 15\sqrt{3}} \)  

c. \( \sqrt{16 + 15\sqrt{3}} \)  

d. \( \sqrt{16 - 15\sqrt{3}} \)  

e. NOTA