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. $840x^4$ b. $2923x^4$ c. $22680x^4$ d. $210x^3$ 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. $\left| \dfrac{2-2i}{3+4i} \right| = ?$

a. $\dfrac{8\sqrt{3}}{25}$ b. $\dfrac{8\sqrt{3}}{25}i$ c. $\dfrac{2+14i}{25}$ d. $\dfrac{2\sqrt{2}}{5}$ 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. $\dfrac{1}{60}$ b. $\dfrac{1}{6}$ c. $\dfrac{1}{3}$ d. $\dfrac{1}{2}$ 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. $\lim\limits_{n \to \infty} \dfrac{3}{n^2}(2+4+6+...+2n) = ?$

a. 2   b. 3   c. 4   d. 6   e. NOTA

8. $\displaystyle\sum_{k=3}^{\infty}\frac{8}{(k+2)(k-2)}=?$.

a. $\dfrac{23}{6}$ b. $\dfrac{-23}{6}$ c. $\dfrac{25}{6}$ d. $\dfrac{-25}{6}$ 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: $\dfrac{\left(x^2-4y^2+4y-1\right)(x+2y)}{\left(x^2-x-4y^2+2y\right)\left(x^2+2y+x-4y^2\right)}$

a. $x+2y$ b. $\dfrac{x+2y}{2}$ c. $\dfrac{1}{(x-2y)(x+2y)}$ d. $\dfrac{1}{x-2y}$ e. NOTA

11. A 4 liter solution is X% acid. If $\dfrac{4}{3}$ 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

$\left[\det\left(A^{-1}\right)+\text{the first row, second column entry of }A^{-1}\right]$.
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. $\varnothing$ b. $\log_3 6$ c. $\log_6 3$ d. $\log_9 6$ 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. $\dfrac{1}{4}$ b. $\dfrac{1}{16}$ 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. $\dfrac{\sqrt{2}}{2}$ e. NOTA

17. Describe the steps of: $f(x) = \dfrac{1}{2}[3x]$, where [ ] represents the greatest integer function.

a. $\dfrac{1}{2}$ unit apart vertically, 3 units long   b. 3 units apart vertically, 2 units long

c. $\dfrac{1}{2}$ unit apart vertically, $\dfrac{1}{3}$ 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 $\dfrac{4 + 4^2 + 4^3 + \ldots + 4^{10}}{4^{-1} + 4^{-2} + 4^{-3} + \ldots + 4^{-10}} = 4^n$ then n =?

a. 0   b. 1   c. 10   d. 11   e. NOTA

20. What is the domain of $y = \log\left(\dfrac{1}{\sqrt{x^2 - 4}}\right)$?

a. $(-\infty, -2] \cup [2, \infty)$ b. $(-\infty, -2) \cup (2, \infty)$ c. $[2, \infty)$ d. $(2, \infty)$ e. NOTA

21. If $\sin x = \dfrac{2}{5}$ and $\sin 3x = \dfrac{L}{U}$ 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. $\sin\left(\sin^{-1}\left(\dfrac{3}{5}\right) - \cos^{-1}\left(\dfrac{12}{13}\right)\right) = ?$

a. $\dfrac{-33}{65}$ b. $\dfrac{16}{65}$ c. $\dfrac{56}{65}$ d. $\dfrac{36}{65}$ 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 $i + 2i^2 + 3i^3 + ...ki^k = 48 + 49i$?

a. 48   b. 49   c. 97   d. 98   e. NOTA

27. If $\begin{array}{l} |L| + L + U = 10 \\ L + |U| - U = 12 \end{array}$ what does L+U=?

a. -2   b. $\dfrac{18}{5}$ c. $\dfrac{22}{3}$ d. 22   e. NOTA

28. If $\sin x + \sin y = \dfrac{\sqrt{15}}{3}$ and $\cos x + \cos y = 1$, what is cos(x-y)?

a. $\dfrac{1}{3}$ b. $\dfrac{1}{2}$ c. $\dfrac{2}{3}$ 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. $\dfrac{6\sqrt{2}}{\pi}$ b. $\dfrac{6\sqrt{3}}{\pi}$ c. $\dfrac{12}{\pi}$ d. $2\pi\sqrt{3}$ e. NOTA

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

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