E means "none of these."

1. If $a_{n+1} = n^3 + 2n - 5$, then $a_{10} =$

   A. 742 B. 750 C. 1015 D. 1025 E. NOTA

2. Find the sum of the infinite sequence: $\frac{2}{3} - \frac{3}{9} + \frac{4}{27} - \frac{5}{81} + \ldots.$

   A. 7/8 B. 5/8 C. 7/4 D. 5/2 E. NOTA

3. Find the equivalent of $3.\overline{75}$ as an improper fraction.

   A. 125/99 B. 124/33 C. 373/99 D. 62/11 E. NOTA

4. Find $(1+i)^{20}$

   A. - 1024 B. - 1024i C. 2048i D. 2048 E. NOTA

5. What is the last digit in 2008^{2008} ?

   A. 0 B. 2 C. 4 D. 6 E. NOTA

6. Find x such that $x = 2 + \cfrac{1}{2 + \cfrac{1}{2 + \cfrac{1}{\ldots}}}$

   A. $-1+\sqrt{2}$ B. $2+\sqrt{2}$ C. $1+\sqrt{2}$ D. $\sqrt{2}$ E. NOTA

7. Evaluate: $\sum_{n=1}^{20} \left(n^2 - 2n + 10\right)$

   A. 8610 B. 2030 C. 2230 D. 2650 E. NOTA

8. Find the sum of the following series: $\frac{1}{\sqrt{2}+1} + \frac{1}{\sqrt{3}+\sqrt{2}} + \frac{1}{\sqrt{4}+\sqrt{3}} + \ldots \frac{1}{\sqrt{10}+\sqrt{9}}$

   A. $\sqrt{10}+1$ B. $\sqrt{10}-1$ C. 2 D. 3 E. NOTA

9. Evaluate: $\sum_{n=3}^{\infty} \frac{3}{4n^2 - 1}$

   A. 0.3 B. 0.4 C. 0.5 D. 0.6 E. NOTA

10. Where on the interval $[0,\pi]$ does $\sum_{n=0}^{\infty}\tan^n x$ converge?

A. $\left(\frac{\pi}{4},\frac{3\pi}{4}\right)$ B. $\left[0,\frac{\pi}{2}\right)\cup\left(\frac{\pi}{2},\pi\right]$

C. $\left[0,\frac{\pi}{4}\right)\cup\left(\frac{3\pi}{4},\pi\right]$ D. $\left(\frac{\pi}{4},\frac{\pi}{2}\right)\cup\left(\frac{\pi}{2},\frac{3\pi}{4}\right)$ E. NOTA

11. Find the smallest possible sum of a geometric series whose third term is 8.

A. 4 B. 5 C. 5.8 D. 6 E. NOTA

12. If $f(x)=\sum_{n=1}^{\infty}nx^{n-1}$, then what is the value of $f\left(\frac{1}{3}\right)$?

A. $\frac{9}{4}$ B. $\frac{1}{2}$ C. $\frac{3}{2}$ D. $\frac{9}{2}$ E. NOTA

13. Which of the following series diverges?

A. $\sum_{n=1}^{\infty}\frac{1}{n^2}$ B. $\sum_{n=1}^{\infty}\frac{1}{n^2-1}$

C. $\sum_{n=1}^{\infty}\frac{n}{n^2-1}$ D. $\sum_{n=1}^{\infty}\frac{n}{n^4+1}$ E. NOTA

14. Evaluate $\sum_{n=2}^{\infty}\frac{1}{x-x^2}$.

A. -1 B. $-\frac{1}{2}$ C. $\frac{1}{2}$ D. 1 E. NOTA

15. $\{a_n\}$ is a recursive sequence such that $a_{n+2}=a_n+2a_{n+1}$ and $a_0=a_1=1$.

Find the value of $\lim_{n\to\infty}\left(\frac{a_{n+1}}{a_n}\right)$.

A. $1-\sqrt{2}$ B. 2 C. $1+\sqrt{2}$ D. ∞ E. NOTA

16. "Infinite Dave" loves fractals. In his newest creation, he has an isosceles right triangle with legs of length 6. He then draws an altitude to the hypotenuse creating two congruent triangles. In one of the smaller triangles, he draws another altitude creating two smaller triangles. If Dave continues to draw altitudes in this manner for the rest of time (infinitely), what will the sum of the lengths of all the altitudes be?

A. $3\sqrt{2}+3$ B. $6\sqrt{2}+6$ C. $6\sqrt{2}+12$ D. $12\sqrt{2}+6$ E. NOTA

17. Find the coefficient of the $(x-2)^4$ term for the Taylor expansion of $f(x)=\ln x$ centered about the point $x=2$.

A. $-\frac{3}{32}$ B. $-\frac{1}{64}$ C. $\frac{1}{64}$ D. $\frac{1}{16}$ E. NOTA

18. The expression $\lim_{n\to\infty}\frac{1+8+27+\ldots+n^3}{n^4}$ can be expressed as which of the following integrals.

A. $\int_1^\infty \frac{1}{x^2-1}dx$ B. $\int_1^\infty \frac{1}{x^3}dx$ C. $\int_0^1 x^2+1dx$ D. $\int_0^1 x^3dx$ E. NOTA

19. Evaluate $\sum_{n=1}^{\infty}\frac{2n}{5^n}$.

A. $\frac{7}{16}$ B. $\frac{1}{2}$ C. $\frac{5}{8}$ D. 1 E. NOTA

20. Find the values of x for which the series $\sum_{n=1}^{\infty}\frac{(-1)^{n+1}(x-2)^n}{n\cdot 2^n}$ convergences.

A. $0<x\le 4$ B. $0<x\le 2$ C. $0<x<4$ D. $0\le x\le 4$ E. NOTA

21. For which of the following series is the Integral Test not applicable?

I) $\sum_{n=1}^{\infty}\frac{n}{n^2+1}$ II) $\sum_{n=0}^{\infty}\frac{\arctan n}{1+n^2}$ III) $\sum_{n=1}^{\infty}e^{2x-x^2}$ IV) $\sum_{n=1}^{\infty}\frac{\ln\left(1/n\right)}{n}$

A. I, II, IV B. II, III, IV C. II, IV D. II, III E. NOTA

22. Find $\frac{dy}{dx}$ given $y=\sqrt{x^2+\sqrt{x^2+\sqrt{x^2+\ldots}}}$.

A. $\frac{2y+x}{2}$ B. $\frac{2x}{y-1}$ C. $\frac{2y+1}{2x}$ D. $\frac{x-2y}{2}$ E. NOTA

23. Find the limit of the sequence $\sqrt{3},\sqrt{3\sqrt{3}},\sqrt{3\sqrt{3\sqrt{3}}}\ldots.$

A. 1 B. 3 C. $3\sqrt{3}$ D. 9 E. NOTA

24. Find the radius of convergence of the series $\sum_{n=1}^{\infty}\frac{(2n)!x^n}{(n!)^2}$.

A. $\frac{1}{4}$ B. $\frac{1}{2}$ C. 1 D. 4 E. NOTA

25. Find the sum of the series $1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{6}+\frac{1}{8}+\frac{1}{9}+\frac{1}{12}\ldots$ where the terms are the reciprocals of the positive integers whose only prime factors are 2s and 3s.

A. $\frac{13}{6}$ B. $\frac{5}{2}$ C. 3 D. $\frac{7}{2}$ E. NOTA

26. Use a 4th degree Maclaurin Polynomial for e^x to approximate e given that $e^0=1$ and $e^1=e$.

A. $\frac{41}{24}$ B. $\frac{65}{24}$ C. $\frac{11}{4}$ D. $\frac{35}{12}$ E. NOTA

27. Describe the convergence or divergence of $\sum_{n=1}^{\infty}\frac{\sin n}{n^2}$.

A. Conditionally Convergent B. Absolutely Convergent
C. Divergent D. Radially Convergent E. NOTA

28. Find the positive value of x for which $\sum_{n=0}^{\infty}\frac{(2x-1)^n}{n!}=6$.

A. $\ln\sqrt{6e}$ B. $\ln 6$ C. $2\ln(6e)$ D. $\ln 36$ E. NOTA

29. Find the interval of convergence for $\sum_{n=1}^{\infty}\frac{(2x)^{2n}}{x^n}$, if x $\neq$ 0.

A. $-\frac{1}{4}\le x<\frac{1}{4}$ B. $-\frac{1}{2}<x\le\frac{1}{2}$ C. $-\frac{1}{2}<x<\frac{1}{2}$ D. $-\frac{1}{4}<x<\frac{1}{4}$ E. NOTA

30. Given that $P(x)$ is the polynomial representation of $y=\cos x$ centered about $x=\frac{\pi}{4}$. Find the coefficient of the x^3 term of $P'(x)$.

A. $-\frac{\sqrt{2}}{4}$ B. $-\frac{\sqrt{2}}{24}$ C. $\frac{\sqrt{2}}{24}$ D. $\frac{\sqrt{2}}{12}$ E. NOTA