MATHS

BOOKS - MBD MATHS (ODIA ENGLISH)

SEQUENCES AND SERIES

Question Bank

1. Which of the following is a sequence ?

A. $f(x) = [x], x \in R$

B. $f(x) = |x|, x \in R$

C. $f(x) = n\sqrt{\pi}, n \in N$

D.

Answer: A::B::C

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2. Determine whether (t_n) is an arithmetic sequence if: $t_n = an^2 + bn$

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3. Determine whether (t_n) is an arithmetic sequence if: $t_n = an + b$

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4. Determine whether (t_n) is an arithmetic sequence if: $t_n = an^2 + b$

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5. If a geometic series converges which of the following is true about its common ratio r?

A. $r > 1$

B. - 1 < r < !`

C. -1 > r > 1`

D. $r > 0$

Answer: A

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6. If an arithmetic series $\sum tn$ converges, which of the following is true about t_n?

A. $t_n < 1$

B. $|t_n| < 1$

C. $t_n = 0$

D. $t_n \to 0$

Answer:

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7. Which of the following is an arithmetico geometric series ?

A. $1 + 3x + 7x^2 + 15x^3 + \ldots.$

B. $x + \frac{1}{2}x + \frac{1}{3}x^2 + \ldots.$

C. $x + (1+2)x^2 + (1+2+3)x^3 + \ldots$

D. $x + 3x^2 + 5x^3 + 7x^4 + \ldots$

Answer: A::B::C::D

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8. For an arithmetic sequence $(t_n)t_p = q, t_q = p, (p \neq q),$ find t_n.

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9. For an arithmetic series $\sum a_n, S_p = q$ and $Sq = p(p \neq q)$find S_{p+q}

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10. The sum of a geometric series is 3. the series of squares of its terms has sum 18. Find the series.

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11. The sum of a geometric series is 14, and the series of cubes of its terms has sum 392 find the series.

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12. Find the sum as directed.$1 + 2a + 3a^2 + 4a^3 + \ldots.$ (first n terms $(a \neq 1)$)

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13. Find the sum as directed.$1 + (1 + x)y + \left(1 + x + x^2\right)y^2 + \ldots$ (to infinity)

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14. Find the sum as directed.$1 + \frac{3}{5} + \frac{7}{25} + \frac{15}{125} + \frac{31}{625} + \ldots$ (to infinity)

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15. Find the sum as directed.$1 + 4x + 8x^2 + 13x^3 + 19x^4 + \ldots$ (to infinity) Assuming that the series has a sum for $|x| < 1$.

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16. Find the sum as directed.$3.2 + 5.2^2 + 7.2^3 + \ldots.$ (first n terms)

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17. Find the sum of the infinite series. $\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \ldots$

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18. Find the sum of the infinite series.$\frac{1}{1.2.3} + \frac{1}{2.3.4} + \frac{1}{3.4.5} + \ldots$

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19. Find the sum of the infinite series.

$$\frac{1}{2.5.8}+\frac{1}{5.8.11}+\frac{1}{8.11.14}+\ldots$$

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20. Find the sum of the infinite series. $\frac{3}{1^2.2^2}+\frac{5}{2^2.3^2}+\frac{7}{3^2.4^2}+\ldots$

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21. Find the sum of the infinite series. $\frac{1}{1.5}+\frac{1}{3.7}+\frac{1}{5.9}+\ldots$

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22. Find S_n for the series. 1.2 + 2.3 + 3.4 +...

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23. Find S_n for the series. 1.2.3 + 2.3.4 + 3.4.5 +....

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24. Find S_n for the series. 2.5.8 + 5.8.11 + 8.11.14 +...

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25. Find S_n for the series. 1.2.3.4 + 2.3.4.5 + 3.4.5.6 +...

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26. Find S_n for the series. 1.5 + 2.6 + 3.7 + ...

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27. Find S_n for the series. 2.3 + 3.6 + 4.11 + ...

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28. Find S_n for the series. $1.3^2 + 2.5^2 + 3.7^2 + \ldots$

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29. Find the sum of first n terms of the series, 5+6+8+12+20+...

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30. Find the sum of first n terms of the series, 4+5+8+13+20+...

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31. Find the sum of the product of 1,2,3....20 taken two at a time.

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32. Do the same for 1, 3, 5, 7,.....19.

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33. If $a = 1, +x + x^2 \ldots$ and $b = 1 + y + y^2 + \ldots [x \mid < 1$ and $]y \mid < 1,$ then prove that $1 - xy + x^2y^2 + x^3y^3 + \ldots. = \frac{ab}{a + b - 1}$

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34. If a,b,c are respectively the p^{th}, q^{th}, r^{th} terms of an A.P.,then prove that $a(q - r) + b(r - p) + c(p - q) = 0$

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35. If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in A.P. and $a+b+c \neq 0_2$ prove that $\frac{b+c}{a}, \frac{c+a}{b}, \frac{a+b}{c}$ are in A.P.

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36. If a^2, b^2, c^2 are in A.P. prove that $\frac{1}{b+c}, \frac{1}{c+a}, \frac{1}{a+b}$ are in A.P.

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37. If $\frac{b+c}{a}, \frac{c+a}{b}, \frac{a+b}{c}$ are in A.P.,prove that $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in A.P. given $a+b+c \neq 0$.

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38. If $(a-c)^2, (c-a)^2, (a-b)^2$ are in A.P.,prove that $\frac{1}{b-c}, \frac{1}{c-a}, \frac{1}{a-b}$ are in A.P.

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39. If a,b,c are respectively the sums of p,q,r terms of an A.P., prove that $\frac{a}{p}(q-r)+\frac{b}{q}(r-p)+\frac{c}{r}(p-q)=0$

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40. If a,b,c,d are in G.P., prove that $\left(a^2+b^2+c^2\right)\left(b^2+c^2+d^2\right)=(ab+bc+cd)^2$.

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41. Expand in ascending powers of x.2^x,

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42. Expand in ascending powers of x. cos x,

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43. Expand in ascending powers of sin x,

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44. Expand in ascending powers of x. $\frac{xe^{7x} - e^{-x}}{e^3 x}$

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45. If $x = y + \frac{y^2}{2!} + \frac{y^3}{3!} + \ldots$ then show that $y = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \ldots$

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46. Find the value of $x^2 - y^2 + \frac{1}{2!}(x^4 - y^4) + \frac{1}{3!}(x^6 - y^6) + \ldots$

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47. Show that $2\left(\frac{1}{3!} + \frac{2}{5!} + \frac{3}{7!} + \ldots\right) = \frac{1}{e}$

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48. Show that $\frac{9}{1!} + \frac{19}{2!} + \frac{35}{3!} + \frac{57}{4!} + \frac{85}{5!} + \ldots = 12e - 5$

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49. Show that $1 + \frac{1+3}{2!} + \frac{1+3+3^2}{3!} + \ldots = \frac{1}{2}(e^3 - e)$

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50. Show that $\frac{1.3}{1!}+\frac{2.4}{2!}+\frac{3.5}{3!}+\frac{4.6}{4!}+\ldots=4e$

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51. Show that $\frac{1}{1.2}+\frac{1.3}{1.2.3.4}+\frac{1.3.5}{1.2.3.4.5.6}+\ldots=\sqrt{e}-1$

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52. Prove that :

$\log e.\left(1+3x+2x^2\right)=3x-\frac{5}{2}x^2+\frac{9}{3}x^3-\frac{17}{4}x^4+\ldots,|x|<\frac{1}{2}$

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53. Prove that :

$\log_e(n+1)-\log_e(n-1)=2\left[\frac{1}{n}+\frac{1}{3n^3}+\frac{1}{5n^5}+\ldots\right]$

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54. Prove that :

$$\log_e(n+1) - \log_e n = 2\left[\frac{1}{2n+1} + \frac{1}{3(2n+1)^3} + \frac{1}{5(2n+1)^5} + \ldots\right]$$

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55. Prove that : $\log_e m - \log_e n = \frac{m-n}{m} + \frac{1}{2}\left(\frac{m-n}{m}\right)^2$

.....m,n>0

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56. Prove that : $\log_e a - \log_e b = 2\left[\frac{a-b}{a+b} + \frac{1}{3}\left(\frac{a-b}{a+b}\right)^3\right.$ +1/5((a-b)/(a+b))^5+...],a > b`

A. 7

B.

C.

D.

Answer:

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