MATHS

NCERT - FULL MARKS MATHEMATICS(TAMIL)

BINOMIAL THEOREM , SEQUENCES AND SERIES

Example

1. Find the expansion of $(2x+3)^5$.

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2. Evaluate 98^4.

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3. Find the middle term in the expansion of $(x + y)^6$.

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4. Find the middle terms in the expansion of $(x + y)^7$.

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5. Find the coefficient of x6 in the expansion of $(3 + 2x)^{10}$.

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6. Find the coefficient of x3 in the expansion of $(2 - 3x)^7$.

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7. The 2^{Nd}, 3^{rd} and 4^{th} terms in the binomial expansion of $(x+a)^n$ are 240, 720 and 1080 for a suitable value of x. Find x, a and n.

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8. Expand $\left(2x - \frac{1}{2x}\right)^4$.

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9. Expand $\left(x^2 + \sqrt{1-x^2}\right)^5 + \left(x^2 - \sqrt{1-x^2}\right)^5$.

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10. Using Binomial theorem ,prove that $6^n - 5n$ always leaves remainder 1 when divided by 25 for all positive integer n.

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11. If the 5^{th} and 9^{th} terms of a harmonic progression are $\frac{1}{19}$ and $\frac{1}{35}$,find the 12^{th} term of the squence.

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12. If the product of the $4^{th}, 5^{th}$ and 6^{Th} terms of a geometric progression is 4096 and if the product of the $5^{th}, 6^{th}$ and 7^{th} terms of it is 32768 ,find the sum of first 8 terms of the geometric progression.

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13. Find the sum up to n terms of the series : $1+\frac{6}{7}+\frac{11}{49}+\frac{16}{343}+....$

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14. Find the sum of the first n terms of the series $\frac{1}{1+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}+...$

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15. Find $\sum_{k=1}^{n} \frac{1}{k(k+1)}$.

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16. Find the sum : $1 + \frac{4}{5} + \frac{7}{25} + \frac{10}{125} + \ldots$

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17. Find $\sum_{n=1}^{\infty} \frac{1}{n^2 + 5n + 6}$.

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18. Expand $\frac{1}{(3+2x)^2}$ in powers of x. Find a condition on x for which the expansion is valid .

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19. Find $\sqrt[3]{65}$.

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20. Prove that $\sqrt[3]{x^3+7}-\sqrt[3]{x^3+4}$ is approximately equal to $\frac{1}{x^2}$ when x is large.

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Exercise 5 1

1. Expand

$$\left(2x^2-\frac{3}{x}\right)^3$$

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2. Expand

$$\left(2x^2 - 3\sqrt{1-x^2}\right)^4 + \left(2x^2 + 3\sqrt{1-x^2}\right)^4$$

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3. Compute

102^4

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4. Compute

99^4

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5. Compute

9^7.

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6. Using binomial theorem, indicate which of the following two number is larger . $(1.01)^{1000000}$, 10000 .

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7. Find the coefficient of x^{15} in $\left(x^2+\frac{1}{x^3}\right)^{10}$.

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8. Find the coefficient of x^6 and the cofficient of x^2 in $\left(x^2-\frac{1}{x^3}\right)^6$.

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9. Find the coefficient of x^6 and the expansion of $\left(1+x^3\right)^{50}\left(x^2+\frac{1}{x}\right)^5$.

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10. Find the constant term of $\left(2x^3 - \frac{1}{3x^2}\right)^5$.

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11. Find the last two digits of the number 3^{600}.

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12. In the binomial expansion of $(a+b)^n$,the coefficients of the 4^{th} and 13^{th} terms are equal to each other ,find n.

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13. If the binomial coefficients of three consecutive terms in the expansion of $(a+x)^n$ are in the ratio $1:7:42$,then find n.

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14. In the binomial coefficients of $(1+x)^n$,the coefficients of the 5^{th}, 6^{th} and 7^{th} terms are in AP. Find all values of n.

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Exercise 5 2

1. Write the first 6 terms of the sequences whose n^{th} terms are given below and classify them as arithmetic progression, geometric progression, arithmetico-geometric progression, harmonic progression and none of them.

$$\frac{1}{2^{n+1}}$$

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2. Write the first 6 terms of the sequences whose n^{th} terms are given below and classify them as arithmetic progression, geometric progression, arithmetico-geometric progression, harmonic progression and none of them.

$$\frac{(n+1)(n+2)}{n+3(n+4)}$$

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3. Write the first 6 terms of the sequences whose n^{th} terms are given below and classify them as arithmetic progression, geometric progression, arithmetico-geometric progression, harmonic progression and none of them.

$$4\left(\frac{1}{2}\right)^{n}$$

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4. Write the first 6 terms of the sequences whose n^{th} terms are given below and classify them as arithmetic progression, geometric progression, arithmetico-geometric progression, harmonic progression and none of them

$$\frac{(-1)^n}{n}$$

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5. Write the first 6 terms of the sequences whose n^{th} terms are given below and classify them as arithmetic progression, geometric progression, arithmetico-geometric progression, harmonic progression and none of them

$$\frac{2n+3}{3n+4}$$

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6. Write the first 6 terms of the sequences whose n^{th} terms are given below and classify them as arithmetic progression, geometric

progression, arithmetico-geometric progression, harmonic progression and none of them

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7. Write the first 6 terms of the sequences whose n^{th} terms are given below and classify them as arithmetic progression, geometric progression, arithmetico-geometric progression, harmonic progression and none of them

$$\frac{3n-2}{3n-1}$$

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8. Write the first 6 terms of the sequences whose n^{th} term a_n is given below.

$$a_n = \begin{cases} n+1 & \text{if n is odd} \\ n & \text{if n is even} \end{cases}$$

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9. Write the first 6 terms of the sequences whose n^{th} term a_n is given below.

$$a_n = \begin{cases} 1 & \text{if n=1} \\ 2 & \text{if n=2} \\ a_{n-1} + a_{n-2} & \text{if } n > 2 \end{cases}$$

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10. Write the first 6 terms of the sequences whose n^{th} term a_n is given below.

$$a_n = \begin{cases} n & \text{if n is 1,2or3} \\ a_{n-1} + a_{n-2} + a_{n-3} & \text{if } n > 3 \end{cases}$$

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11. Write the n^{th} term of the following sequences.

2, 2, 4, 4, 6, 6,...

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12. Write the n^{th} term of the following sequences.

$\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \ldots$

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13. Write the n^{th} term of the following sequences.

$\frac{1}{2}, \frac{3}{4}, \frac{5}{6}, \frac{7}{8}, \frac{9}{10}, \ldots$

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14. Write the n^{th} term of the following sequences.

$6, 10, 4, 12, 2, 14, 0, 16, -2, \ldots$

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15. The product of three in creasing number sin GP is 5832.Ifwe add 6 to the second number and 9 to the third number, then resulting numbers

form an AP. Find the numbers in GP.

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16. Write the n^{th} term of the sequence $\frac{3}{1^2 2^2}, \frac{5}{2^2 3^2}, \frac{7}{3^2 4^2}, \ldots$ as a difference of two terms.

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17. The AM of two numbers exceeds their GM by 10 and HM by 16 . Find the numbers.

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Exercise 5 3

1. Find the sum of the first 20-terms of the arithmetic progression having the sum of first 10 terms as 52 and the sum of the first 15 terms as 77.

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2. Find the sum up to the 17^{th} term of the series $\frac{1^3}{1} + \frac{1^3+2^3}{1+3} + \frac{1^3+2^3+3^3}{1+3+5} + ...$

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3. Compute the sum of first n terms of the following series:

$8 + 88 + 888 + 8888 + ...$

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4. Compute the sum of first n terms of the following series:

$6 + 66 + 666 + 6666 + ...$

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5. Compute the sum of first n terms of $1+(1+4)+\left(1+4+4^2\right)+\left(1+4+4^2+4^3\right)+\ldots$

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6. Find the general term and sum to n terms of the sequence $1, \frac{4}{3}, \frac{7}{9}, \frac{10}{27}, \ldots$

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7. Find the value of n, if the sum to n terms of the series $\sqrt{3}+\sqrt{75}+\sqrt{243}+\ldots$ is $432\sqrt{3}$.

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8. A man repays an amount of Rs.3250 by paying Rs.20 in the first month and then increases the payment by Rs.15 per month. How long will it take

him to clear the amount?

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9. In a race, 20 balls are placed in a line at intervals of 4 meters, with the first ball 24 meters away from the starting point. A contestant is required to bring the balls back to the starting place one at a time. How far would the contestant run to bring back all balls?

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10.

Thenumberofbacteriainacertainculturedoubleseveryhour.Iftherewere30bacter

the culture originally, how many bacteria will be present at the end of 2nd hour, 4th hour and nth hour?

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11.

WhatwillRs.500amountstoin10yearsafteritsdepositinabankwhichpaysannualin

of 10% compounded annually?

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12. In a certain town, a viral disease caused severe health hazards upon its people disturbing their normal life. Itwas foundthat on each day, thevirus whichcausedthe disease spreadin Geometric Progression. The amount of infectious virus particle gets doubled each day, being 5 particles on the first day. Find the day when the infectious virus particles just grow over 1,50,000 units?

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Exercise 5 4

1. Expandthefollowinginascendingpowersof x andfindtheconditionon x forwhichthebinomial expansion is valid.

$$\frac{1}{5+x}$$

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2. Expandthefollowinginascendingpowersof x andfindtheconditionon x forwhichthebinomial expansion is valid.

$$\frac{2}{(3+4x)^2}$$

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3. Expandthefollowinginascendingpowersof x andfindtheconditionon x forwhichthebinomial expansion is valid.

$$(5+x^2)^{\frac{2}{3}}$$

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4. Expandthefollowinginascendingpowersof x andfindtheconditionon x forwhichthebinomial expansion is valid.

$(x+2)^{-\frac{2}{3}}$

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5. Find $\sqrt[3]{1001}$ approximately (two decimal places).

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6. Write the first 6 terms of the exponential series

e^{5x}

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7. Write the first 6 terms of the exponential series

e^{-2x}

View Text Solution

View Text Solution

8. Write the first 6 terms of the exponential series

$e^{\frac{1}{2}x}$

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9. Write the first 4 terms of the logarithmic series

$\log(1+4x)$ Find the intervals on which the expansions are valid.

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10. Write the first 4 terms of the logarithmic series

$\log(1-2x)$ Find the intervals on which the expansions are valid.

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11. Write the first 4 terms of the logarithmic series

$\log\left(\frac{1+3x}{1-3x}\right)$ Find the intervals on which the expansions are valid.

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12. Write the first 4 terms of the logarithmic series

$\log\left(\frac{1-2x}{1+2x}\right)$.Find the intervals on which the expansions are valid.

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13. If p-q is small compared to either p or q, the show that $\sqrt[n]{\frac{p}{q}} \cong \frac{(n+1)p+(n-1)q}{(n-1)p+(n+1)q}$.Hence find $\sqrt[8]{\frac{15}{16}}$.

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14. Find the coefficient of x^4 in the expansion of $\frac{3-4x+x^2}{e^{2x}}$

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15. Find the value of $\sum_{n=1}^{\infty} \frac{1}{2n-1}\left(\frac{1}{9^{n-1}}+\frac{1}{9^{2n-1}}\right)$.

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Exercise 5 5

1. Choose the correct or the most suitable answer.

The value of 2+4+6+⋯+2n is

A. $\frac{n(n-1)}{2}$

B. $\frac{n(n+1)}{2}$

C. $\frac{2n(2n+1)}{2}$

D. $n(n+1)$

Answer: D

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2. The coefficient of x^6 in $(2+2x)^{10}$ is

A. ${}^{10}C_6$

B. 2^6

C. ${}^{10}C_6 2^6$

D. ${}^{10}C_6 2^{10}$.

Answer: D

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3. The coefficient of $x^8 y^{12}$ in the expansion of $(2x+3y)^{20}$ is

A. 0

B. $2^8 3^{12}$

C. $2^8 3^{12} + 2^{12} 3^8$

D. ${}^{20}C_8 2^8 3^{12}$.

Answer: D

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4. If ${}^nC_{10} > {}^nC_r$ for all possible r , then a value of n is

A. 10

B. 21

C. 19

D. 20

Answer: D

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5. If a is the arithmetic mean and g is the geometric mean of two numbers, then

A. $a \leq g$

B. $a \geq g$

C. a=g

D. $a > g.$

Answer: B

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6. If $\left(1+x^2\right)^2(1+x)^n = a_0 + a_1x + a_2x^2 + \ldots + x^{n+4}$ and if a_0, a_1, a_2 are in AP , then n is

A. 1

B. 2

C. 3

D. 4

Answer: C

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7. If a,8 ,b are in AP,a,4b are in GP , and if a,x,b are in HP then x is

A. 2

B. 1

C. 4

D. 16

Answer: A

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8. The sequence $\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}+\sqrt{2}}, \frac{1}{\sqrt{3}+2\sqrt{2}}$,... form an

A. AP

B. GP

C. HP

D. AGP.

Answer: C

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9. The HM of two positive numbers whose AM and GM are 16,8 respectively is

A. 10

B. 6

C. 5

D. 4

Answer: D

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10. If S_n denotes the sum of n terms of an AP whose common difference is d,the value of $S_n - 2S_{n-1} + S_{n-2}$ is

A. 0

B. 2d

C. 4d

D. d^2.

Answer: A

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11. The remainder when 38^{15} is divided by 13 is

A. 12

B. 1

C. 11

D. 5

Answer: A

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12. The n^{th} term of the sequence 1,2,4,7,11,... is

A. $n^3 + 3n^2 + 2n$

B. $n^3 - 3n^2 + 3n$

C. $\frac{n(n+1)(n+2)}{3}$

D. $\frac{n^2 - n + 2}{2}$

Answer: D

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13. The sum up to n terms of the series $\frac{1}{\sqrt{1}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{5}} + \frac{1}{\sqrt{5}+\sqrt{7}} + ...$ is

A. $\sqrt{2n+1}$

B. $\frac{\sqrt{2n+1}}{2}$

C. $\sqrt{2n+1}-1$

D. $\frac{\sqrt{2n+1}-1}{2}$

Answer: D

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14. The n^{th} term of the sequence $\frac{1}{2}, \frac{3}{4}, \frac{7}{8}, \frac{15}{16}, \ldots$ is

A. $2^n - n - 1$

B. $1 - 2^{-n}$

C. $2^{-n} + n - 1$

D. 2^{n-1}

Answer: B

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15. The sum up to n terms of the series $\sqrt{2}+\sqrt{8}+\sqrt{18}+\sqrt{32}$+... is

A. $\frac{n(n+1)}{2}$

B. $2n(n+1)$

C. $\frac{n(n+1)}{2}$

D. 1

Answer: C

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16. The value of the series $\frac{1}{2}+\frac{7}{4}+\frac{13}{8}+\frac{19}{16}$+.... is

A. 14

B. 7

C. 4

D. 6

Answer: B

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17. The sum of an infinite GP is 18. If the first term is 6, the common ratio is

A. $\frac{1}{3}$

B. $\frac{2}{3}$

C. $\frac{1}{6}$

D. $\frac{3}{4}$.

Answer: B

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18. The coefficient of x^5 in the series e^{-2x} is

A. $\frac{2}{3}$

B. $\frac{3}{2}$

C. $\frac{-4}{15}$

D. $\frac{4}{15}$.

Answer: C

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19. The value of $\frac{1}{2!}+\frac{1}{4!}+\frac{1}{6!}+$ ...is

A. $\frac{e^2+1}{2e}$

B. $\frac{(e+1)^2}{2e}$

C. $\frac{(e-1)^2}{2e}$

D. $\frac{e^2+1}{2e}$

Answer: C

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20. The value of $1-\frac{1}{2}\left(\frac{2}{3}\right)+\frac{1}{3}\left(\frac{2}{3}\right)^{2}-\frac{1}{4}\left(\frac{2}{3}\right)^{3}+\ldots$ is

A. $\log\left(\frac{5}{3}\right)$

B. $\frac{3}{2}\log\left(\frac{5}{3}\right)$

C. $\frac{5}{3}\log\left(\frac{5}{3}\right)$

D. $\frac{2}{3}\log\left(\frac{2}{3}\right)$.

Answer: B

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