



MATHS

JEE (MAIN AND ADVANCED) MATHEMATICS

LOGARITHMIC SERIES

Exercise I A Class Work

1. $e \left[(x-1) - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3 - \frac{1}{4}(x-1)^4 + \dots \dots \dots \infty \right] =$

A. x

B. $x + 1$

C. $x - 1$

D. $x - 2$

Answer: A



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2. $\frac{1}{3} - \frac{1}{2} \cdot \frac{1}{9} + \frac{1}{3} \cdot \frac{1}{27} - \frac{1}{4} \cdot \frac{1}{81} + \dots \infty =$

A. $\log_e(2/3)$

B. $-\log_e(2/3)$

C. $\log_e(4/3)$

D. $-\log_e(4/3)$

Answer: C



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3. If $|x| < 1$ and $y = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$, then $x =$

A. $y + \frac{y^2}{2!} + \frac{y^3}{3!} + \dots \infty$

B. $y - \frac{y^2}{2} + \frac{y^3}{3} - \dots \infty$

C. $y - \frac{y^2}{2!} + \frac{y^3}{3!} + \dots \infty$

D. $y - \frac{y^2}{2!} + \frac{y^3}{3!} - \dots \infty$

Answer: A



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4. $3 \log 2 + \frac{1}{4} - \frac{1}{2} \left(\frac{1}{4} \right)^2 + \frac{1}{3} \left(\frac{1}{4} \right)^3 - \dots =$

A. $\log 3$

B. $\log 5$

C. $\log 10$

D. $\log 2$

Answer: C



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5. The n th term of $\log_e 2$ is

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

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

C. $\frac{(-1)^{n-1}}{n \cdot 3^n}$

D. $\frac{(-1)^{n-1}}{n \cdot 4^n}$

Answer: B



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6. $-\frac{2}{3} - \frac{1}{2} \left(\frac{4}{9} \right) - \frac{1}{3} \left(\frac{8}{27} \right) - \frac{1}{4} \left(\frac{16}{81} \right) - \dots \dots \infty =$

A. $-\log_e 3$

B. $-\log_e 2$

C. $\log_e 2$

D. $\log_e 3$

Answer: A



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7. $(\sqrt{3} - 1) + \frac{1}{2}(\sqrt{3} - 1)^2 + \frac{1}{3}(\sqrt{3} - 1)^3 + \dots \infty$

A. $\log(3 + \sqrt{2})$

B. $\log 2$

C. 0

D. $\log(2 + \sqrt{3})$

Answer: D

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8. If $\log_e k = 2 \left[\frac{3}{5} + \frac{1}{3} \left(\frac{3}{5} \right)^3 + \frac{1}{5} \left(\frac{3}{5} \right)^5 + \dots \infty \right]$ then $k =$

A. 2

B. 3

C. 4

D. 8

Answer: C

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9. $\log 2 + 2 \left[\frac{1}{5} + \frac{1}{3 \cdot 5^3} + \frac{1}{5 \cdot 5^5} + \dots \infty \right] =$

A. $\log 2$

B. $\log 3$

C. $\log 5$

D. $\log 6$

Answer: B



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10. $\left(1 + \frac{1}{3} \cdot \frac{1}{2^2} + \frac{1}{5} \cdot \frac{1}{2^4} + \frac{1}{7} \frac{1}{2^6} + \dots \cdot \infty\right) =$

A. $\log_e 2$

B. $\log_e 3$

C. $\log_e 4$

D. $\log_e 5$

Answer: B



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Exercise I B Home Work

1. find the value of given domain and express in form of logarithm

function $\frac{1}{2} - \frac{1}{2} \cdot \frac{1}{2^2} + \frac{1}{3} \cdot \frac{1}{2^3} - \dots \infty =$

A. $\log_e \left(\frac{2}{3} \right)$

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

C. $\log_e^2$

D. $\log_e^3$

Answer: B



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2. The 8^{th} term of $\log_e 2$ is

A. $\frac{1}{8}$

B. $-\frac{1}{8}$

C. $\frac{1}{7}$

D. $-\frac{1}{7}$

Answer: B



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3. Coefficient of x^2 in $\log(1+x) =$

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

B. $-\frac{1}{2}$

C. $-\frac{1}{4}$

D. 1

Answer: B

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4. If $y = x + \frac{x^2}{2} + \frac{x^3}{3} + \dots \infty$, then $x =$

A. e^{-y}

B. $1 + e^{-y}$

C. $1 - e^{-y}$

D. 1

Answer: C

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5. $\frac{a-b}{a} + \frac{1}{2} \left(\frac{a-b}{a} \right)^2 + \frac{1}{3} \left(\frac{a-b}{a} \right)^3 + \dots =$

A. $\log_e(ab)$

B. $\log_e a \cdot \log_e b$

C. $\log_e (a/b)$

D. 1

Answer: C



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6. $\cot^2 x - \frac{1}{2} \cot^4 x + \frac{1}{3} \cot^6 x - \frac{1}{4} \cot^8 x + \dots \infty =$

A. $\log \tan x$

B. $2 \log \tan x$

C. $2 \log \operatorname{cosec} x$

D. $\log \operatorname{cosec} x$

Answer: C



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7. $e^{2\left(\frac{1}{3} + \frac{1}{3} \cdot \frac{1}{3^3} + \frac{1}{5} + \frac{1}{5} \cdot \frac{1}{5^5} + \dots\right)} =$

A. 2

B. 4

C. 1

D. 3

Answer: A



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8. $\tan \theta + \frac{1}{3} \tan^3 \theta + \frac{1}{5} \tan^5 \theta + \dots =$

A. $\frac{1}{2} \log \left[\sin \left(\frac{\pi}{4} + \theta \right) \right]$

B. $\frac{1}{2} \log \left[\cos \left(\frac{\pi}{4} + \theta \right) \right]$

C. $\frac{1}{2} \log \left[\tan \left(\frac{\pi}{4} + \theta \right) \right]$

D. $\frac{1}{2} \log \left[\cot \left(\frac{\pi}{4} + \theta \right) \right]$

Answer: C



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9. $\cos x + \frac{1}{3} \cos^3 x + \frac{1}{5} \cos^5 x + \dots \dots \infty =$

A. $\log \tan x$

B. $\log \cot x$

C. $\log \tan(x/2)$

D. $\log \cot(x/2)$

Answer: D



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Exercise II A Class Work

1.
$$\frac{(y-1) - \frac{1}{2}(y-1)^2 + \frac{1}{3}(y-1)^3 - \dots \infty}{(a-1) - \frac{1}{2}(a-1)^2 + \frac{1}{3}(a-1)^3 - \dots \infty} =$$

A. $\log_y a$

B. $\log_a y$

C. $\log_a (y/a)$

D. $\log_e (a/y)$

Answer: B



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2. If $y = x + \frac{x^2}{2} + \frac{x^3}{3} + \dots \infty$, then $x =$

A. $\log(1+x)$

B. $-\log(1 + x)$

C. $\frac{-\log(1 + x)}{x}$

D. $\frac{\log_e(1 + x)}{x}$

Answer: D



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3. If $f(x) = 1 - x + x^2 - x^3 + x^4 + \dots \infty$ then

$$\int_0^x f(x) dx =$$

A. $\log x$

B. $\log(1 - x)$

C. $\log(1 + x)$

D. $\log(1 + x^2)$

Answer: C

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4. $\frac{1}{2} \left(\frac{1}{5} + \frac{1}{7} \right) - \frac{1}{4} \left(\frac{1}{5^2} + \frac{1}{7^2} \right) + \frac{1}{6} \left(\frac{1}{5^3} + \frac{1}{7^3} \right) - \dots \infty =$

A. $\frac{1}{2} \log_e (5/7)$

B. $\frac{1}{2} \log_e (47/35)$

C. $\log_e (47/35)$

D. $\log_e (35/47)$

Answer: B

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5. If α, β are the roots of $x^2 - px + q = 0$ then

$$(\alpha + \beta)x - (\alpha^2 + \beta^2) \frac{x^2}{2} + (\alpha^3 + \beta^3) \frac{x^3}{3} - \dots \infty =$$

A. $\log(1 + px + qx^2)$

B. $\log(1 - px + qx^2)$

C. $\log(1 + px - qx^2)$

D. $\log(1 - px - qx^2)$

Answer: A



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6. n^{th} term of $\log_e(6/5)$ is

A. $\frac{(-1)^{n-1}}{5^n}$

B. $\frac{(-1)^{n-1}}{n \cdot 5^n}$

C. $\frac{(-1)^{n-1}}{6^n}$

D. $\frac{(-1)^{n-1}}{n \cdot 6^n}$

Answer: B



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$$7. \log_4 2 - \log_8 2 + \log_{16} 2 - \dots =$$

A. e^2

B. $\log_e 2 + 1$

C. $\log_e 3 - 2$

D. $1 - \log_e 2$

Answer: D



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$$8. 2 \cdot 4^{\frac{-1}{4}} \cdot 8^{\frac{1}{9}} \cdot 16^{\frac{-1}{16}} \cdot 32^{\frac{1}{25}} \cdot 64^{\frac{-1}{36}} \cdot \dots \infty =$$

A. $3^{\log 3}$

B. $3^{\log 2}$

C. $2^{\log 2}$

D. $2^{\log 3}$

Answer: C



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9. $\frac{1}{1.2} - \frac{1}{2.3} + \frac{1}{3.4} - \frac{1}{4.5} + \dots =$

A. $2\log_e^2$

B. $2\log_e^2 + 1$

C. $\log_e^2$

D. $\log_e \left(\frac{4}{e} \right)$

Answer: D



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10. $\frac{4}{1.3} - \frac{6}{2.4} + \frac{12}{5.7} - \frac{14}{6.8} + \dots =$

A. $\log_e \left(\frac{2}{e} \right)$

B. $\log_e \left(\frac{e}{2} \right)$

C. $\log_e 2$

D. 0

Answer: C



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11. $\frac{1}{1.3} + \frac{1}{2.5} + \frac{1}{3.7} + \frac{1}{4.9} + \dots =$

A. $2\log_e 2 - 2$

B. $2 - 2\log_e 2$

C. $2\log_e 4$

D. $\log_e 4$

Answer: B



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12. The 3^{rd} , 4^{th} , 5^{th} terms in the expansion of $\log_e 2$ are respectively a, b, c then their ascending order is

A. a, b, c

B. b, c, a

C. c, a, b

D. c, b, a

Answer: B



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13. $\sum_{n=1}^{\infty} \frac{1}{2n(2n+1)} =$

A. $\log_e \left(\frac{2}{e} \right)$

B. $1 - \log_e 2$

C. $1 - \log_e \frac{1}{2e}$

D. $\log_e 2$

Answer: B



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14. $-2 \left[\frac{1}{8} + \frac{1}{64} + \frac{1}{384} + \dots \dots \infty \right] =$

A. $\log_e (1/4)$

B. $\log_e (1/2)$

C. $\log_e (3/4)$

D. $\log_e(3/8)$

Answer: C



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15. If $|x| < 1$ then coefficient of x^n in $\log_{10}(1 - x)$ is

A. $-\frac{1}{n}$

B. $-\frac{1}{n} \log_{10} e$

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

D. 1

Answer: B



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16. $\log(1 + x + x^2 + \dots \infty) =$

A. $x + \frac{x^2}{2} + \frac{x^3}{3} + \frac{x^4}{4} + \dots \infty$

B. $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots \infty$

C. $1 + x + \frac{x^2}{2} + \frac{x^3}{3} + \frac{x^4}{4} + \dots \infty$

D. $1 - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots \infty$

Answer: A



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17. $\frac{2}{1} \cdot \frac{1}{3} + \frac{3}{2} \cdot \frac{1}{9} + \frac{4}{3} \cdot \frac{1}{27} + \frac{5}{4} \cdot \frac{1}{81} + \dots \infty =$

A. $\log_e \left(\frac{3}{2} \right)$

B. $\frac{1}{2} + \log_e \left(\frac{3}{2} \right)$

C. $\frac{1}{2}$

D. $\frac{1}{2} - \log_e \left(\frac{3}{2} \right)$

Answer: B



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18. $\frac{\sqrt{2} - 1}{\sqrt{2}} + \frac{3 - 2\sqrt{2}}{4} + \frac{5\sqrt{2} - 7}{6\sqrt{2}} + \dots \dots \infty =$

A. $\log 2$

B. $\log 3$

C. $\log \sqrt{2}$

D. $\log \sqrt{3}$

Answer: C



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19. Assertion (A) :

If $x + \frac{x^2}{2} + \frac{x^3}{3} + \dots \dots \dots \infty = \log\left(\frac{7}{6}\right)$ then $x = \frac{1}{7}$

Reason (R) :

If $|x| < 1$, then $x + \frac{x^2}{2} + \frac{x^3}{3} + \dots \dots \infty = \log\left(\frac{1}{1-x}\right)$

- A. A is true, R is true and R is correct explanation of A
- B. A is true, R is true and R is not correct explanation of A
- C. A is true, R is false
- D. A is false, R is true

Answer: A



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20. If $f(x) = \frac{1}{x+1} + \frac{1}{2(x+1)^2} + \frac{1}{3(x+1)^3} + \dots (x > 1)$ and $f(1), f(2), f(3)$ are respectively p, q, r then their ascending order is

A. p, q, r

B. r, p, q

C. r, q, p

D. p, r, q

Answer: C



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21. $y = 2x^2 - 1$, then $\frac{1}{x^2} + \frac{1}{2x^4} + \frac{1}{3x^6} + \dots \infty$

A. $-\log\left(\frac{y-1}{y+1}\right)$

B. $-\log\left(\frac{1+y}{1-y}\right)$

C. $-\log\left(\frac{1-y}{1+y}\right)$

D. $-\log\left(\frac{2+y}{2-y}\right)$

Answer: A

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22. If $|a| < 1$, $b = \sum_{k=1}^{\infty} \frac{a^k}{k} \Rightarrow a =$

A. $\sum_{k=1}^{\infty} \frac{(-1)^k b^k}{k}$

B. $\sum_{k=1}^{\infty} \frac{(-1)^{k-1} b^k}{k!}$

C. $\sum_{k=1}^{\infty} \frac{(-1)^k b^k}{(k-1)!}$

D. $\sum_{k=1}^{\infty} \frac{(-1)^{k-1} b^k}{(k+1)!}$

Answer: B

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23. If $x > 0$ then $\frac{x-1}{x+1} + \frac{1}{2} \frac{x^2-1}{(x+1)^2} + \frac{1}{3} \frac{x^3-1}{(x+1)^3} + \dots =$

A. $\log_e x$

B. $\log_e(1/x)$

C. $\log_e(1+x)$

D. $\log_e(1-x)$

Answer: A



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24. Statement-I :

$$\left(\frac{x-y}{x}\right) + \frac{1}{2}\left(\frac{x-y}{x}\right)^2 + \frac{1}{3}\left(\frac{x-y}{x}\right)^3 + \dots = \log_e x - \log_e y$$

Statement-II :

$$(a-1) - \frac{(a-1)^2}{2} + \frac{(a-1)^3}{3} - \frac{(a-1)^4}{4} + \dots = \log_e a$$

Which of the above statements true

A. Only I

B. Only II

C. both I & II

D. neither I nor II

Answer: C



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25. Statement-I :

$$\log(1 + x + x^2 + \dots) = x + \frac{x^2}{2} + \frac{x^3}{3} + \frac{x^4}{4} + \dots$$

Statement-II : 4th term of $\log(3/2)$ is $\frac{-1}{64}$

Statement-III:

$$\tan^2 x - \frac{1}{2}\tan^4 x + \frac{1}{3}\tan^6 x \dots\dots\dots = 2 \log(\sec x)$$

Which of the above statements are true

A. I, II are true

B. II, III are true

C. I, III are true

D. All are true

Answer: B



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26. Observe the following lists

List-I

$$(A) 1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \frac{1}{5} + \dots \infty$$

$$(B) \frac{1}{5} + \frac{1}{2.5^2} + \frac{1}{3.5^3} + \dots \infty$$

$$(C) \frac{1}{n+1} + \frac{1}{2(n+1)^2} + \frac{1}{3(n+1)^3} \dots \infty$$

$$(D) 1 + \frac{1}{3.3^3} + \frac{1}{5.3^5} + \dots \infty$$

List-II

$$(1) \frac{2}{3} + \frac{1}{2} \log 2$$

$$(2) \log_e 2$$

$$(3) -\log_e \left(\frac{4}{5} \right)$$

$$(4) \log_e \left(\frac{5}{4} \right)$$

$$(5) -\log_e \left(1 - \frac{1}{n+1} \right)$$

The correct match for List - I from List -II is

$$\text{A.} \quad \begin{array}{cccc} A & B & C & D \\ 2 & 4 & 1 & 5 \end{array}$$

$$\text{B.} \quad \begin{array}{cccc} A & B & C & D \\ 4 & 2 & 5 & 3 \end{array}$$

$$\text{C.} \quad \begin{array}{cccc} A & B & C & D \\ 3 & 2 & 5 & 4 \end{array}$$

$$\text{D.} \quad \begin{array}{cccc} A & B & C & D \\ 2 & 3 & 5 & 1 \end{array}$$

Answer: D



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27. $\frac{1}{4} + \frac{1}{3} \left(\frac{1}{4} \right)^3 + \frac{1}{5} \left(\frac{1}{4} \right)^5 + \dots \cdot \infty = \dots$

A. $4 \log 3$

B. $\log 3$

C. $\frac{1}{2} \log 5/3$

D. $\frac{1}{2} \log 3/5$

Answer: C



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28. $1 + \frac{1}{3 \cdot 2^2} + \frac{1}{5 \cdot 2^4} + \frac{1}{7 \cdot 2^6} + \dots =$

A. 1

B. $\log_e 2$

C. $\log_e 3$

D. $\log_e 4$

Answer: C



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29. If $y + \frac{y^3}{3} + \frac{y^5}{5} + \dots \infty = 2 \left[x + \frac{x^3}{5} + \frac{x^5}{5} + \dots \infty \right]$ then

A. $x^2 y = 2x - y$

B. $x^2 = x - y$

C. $x^2 = y$

D. $x = y^2$

Answer: A

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30. $\sin 2\theta + \frac{1}{3}\sin^3 2\theta + \frac{1}{5}\sin^5 2\theta + \dots =$

A. $\log \left[\tan \left(\frac{\pi}{4} + \theta \right) \right]$

B. $\log \left[\cot \left(\frac{\pi}{4} + \theta \right) \right]$

C. $\log \tan \theta$

D. $\log \cot \theta$

Answer: A

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31. If $0 < y < 2^{1/3}$ and $x(y^3 - 1) = 1$ then

$$\frac{2}{x} + \frac{2}{3x^3} + \frac{2}{5x^5} + \dots \infty$$

A. $\log \left(\frac{y^3}{2 - y^3} \right)$

B. $\log\left(\frac{y^3}{1-y^3}\right)$

C. $\log\left(\frac{2y^3}{1-y^3}\right)$

D. $\log\left(\frac{y^3}{1-2y^3}\right)$

Answer: A



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32. If x, y, z are three consecutive positive integers then

$$\frac{1}{2}\log_e x + \frac{1}{2}\log_e z + \frac{1}{2xz+1} + \frac{1}{3}\left(\frac{1}{2xz+1}\right)^3 + \dots =$$

A. $\log_a y$

B. $\log_e(1/y)$

C. $\log_e y$

D. 1

Answer: C

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33. $\sum_{n=1}^{\infty} \frac{1}{2n-1} \cdot x^{2n} =$

A. $\frac{x}{2} \log \left(\frac{1+x}{1-x} \right)^x$

B. $\frac{1}{2} \log \left(\frac{1+x^2}{1-x^2} \right)$

C. $x \log \frac{1+x}{1-x}$

D. $\frac{x}{2} \log \left(\frac{1+x}{1-x} \right)$

Answer: D

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34. If $0 < y < 1$, then $\sum_{n=1}^{\infty} \frac{1}{2n-1} \cdot y^{n+1} = \dots\dots$

A. $\frac{y^{3/2}}{2} \log \left(\frac{1+\sqrt{y}}{1-\sqrt{y}} \right)$

B. $y^{3/2} \log \left(\frac{1 - \sqrt{y}}{1 + \sqrt{y}} \right)$

C. $y^{1/2} \log \left(\frac{1 + \sqrt{y}}{1 - \sqrt{y}} \right)$

D. $y^{1/2} \log \left(\frac{1 - \sqrt{y}}{1 + \sqrt{y}} \right)$

Answer: A



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35. If $\log_e \left(\frac{1+x}{1-x} \right) = a_0 + a_1x + a_2x^2 + \dots \infty$ then a_1, a_3, a_5 are in

A. A.P.

B. G.P.

C. H.P.

D. A.G.P.

Answer: C

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36. Assertion (A) : The coefficient of x^5 in the expansion $\log_e \left(\frac{1+x}{1-x} \right)$ is $\frac{2}{5}$

Reason (R) : The equality

$$\log \left(\frac{1+x}{1-x} \right) = 2 \left[x + \frac{x^2}{2} + \frac{x^3}{3} + \frac{x^4}{4} + \dots \infty \right] \text{ is valid for } |x| < 1$$

- A. A is true, R is true and R is correct explanation of A
- B. A is true, R is true and R is not correct explanation of A
- C. A is true, R is false
- D. A is false, R is true

Answer: C

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37. If n is a multiple of 3, then coefficient of x^n in $\log(1 + x + x^2)$ is

A. $-\frac{2}{n}$

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

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

D. $-\frac{1}{n}$

Answer: A



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38. If n is not a multiple of 3, then the coefficient of x^n in the expansion of $\log(1 + x + x^2)$ is

A. n

B. $\frac{1}{n}$

C. $\frac{2}{n}$

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

Answer: B



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39. Match the following for coefficient of x^n in $\log_e(1 + x + x^2)$

List -I List - II

(1) $n = 6$ (a) 1

(2) $n = 3$ (b) $\frac{1}{2}$

(3) $n = 2$ (c) $-\frac{2}{3}$

(4) $n = 1$ (d) $-\frac{1}{3}$

A. $\begin{matrix} 1 & 2 & 3 & 4 \\ a & b & c & d \end{matrix}$

B. $\begin{matrix} 1 & 2 & 3 & 4 \\ b & c & d & a \end{matrix}$

C. $\begin{matrix} 1 & 2 & 3 & 4 \\ d & b & c & a \end{matrix}$

D. $\begin{matrix} 1 & 2 & 3 & 4 \\ d & c & b & a \end{matrix}$

Answer: D

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40. If $|x| < 1$, the coefficient of x^3 in the expansion of $\log(1 + x + x^2)$ in ascending power of x , is

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

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

C. $\frac{-2}{3}$

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

Answer: C

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Exercise II B Home Work

1. If $f(x) = \frac{x^2}{1.2} - \frac{x^3}{2.3} + \frac{x^4}{3.4} - \frac{x^5}{4.5} + \dots \infty$ then

A. $\log_e \left(\frac{1+x}{1-x} \right)$

B. $\log_e(1+x)$

C. $(1+x)\log_e(1+x) - x$

D. $\log_e(1-x)$

Answer: C



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2. The 4^{th} term of $\log_e \frac{3}{2}$ is

A. $\frac{1}{16}$

B. $-\frac{1}{16}$

C. $-\frac{1}{64}$

D. $\frac{1}{64}$

Answer: C



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3. Coefficient of x^n in $\log_e \left(1 + \frac{x}{2} \right)$ is

A. $\frac{1}{n \cdot 2^n}$

B. $\frac{(-1)^{n-1}}{n \cdot 2^n}$

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

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

Answer: B



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4. If p is a prime, then sum of

$$\log_p p^{1/2} - \log_p p^{1/3} + \log_p p^{1/4} - \dots =$$

A. $1 + \log 2$

B. $1 + \log 3$

C. $1 - \log 2$

D. $2 - \log 2$

Answer: C



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5. $\log_2 e - \log_4 e + \log_8 e - \dots \infty =$

A. 0

B. 1

C. e

D. $\frac{e}{2}$

Answer: B



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6. $\log 5 - \frac{\log 25}{2^2} + \frac{\log 125}{3^2} - \frac{\log 625}{4^2} + \dots$

A. $\log 2$

B. $\log 5$

C. $\log 2 * (\log 5)$

D. $\log 10$

Answer: C



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7. $\frac{1}{2.3} + \frac{1}{4.5} + \frac{1}{6.7} + \dots \infty =$

A. $1 + \log_e 2$

B. $1 - \log_e 2$

C. $\frac{1}{2} - \log_e 2$

D. $\log_e 2$

Answer: B



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8. $\frac{1}{1.2} + \frac{1}{3.4} + \frac{1}{5.6} + \dots$

A. $\log_2 e$

B. $\log_e 2$

C. $\log_e 3$

D. $\log_3 e$

Answer: B



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9. Sum of the series

$$\frac{1}{2} \left(\frac{1}{2} + \frac{1}{3} \right) - \frac{1}{4} \left(\frac{1}{2^2} + \frac{1}{3^2} \right) + \frac{1}{6} \left(\frac{1}{2^3} + \frac{1}{3^3} \right) - \dots \text{ is}$$

A. $\log_e 3$

B. $\frac{1}{2} \log_e 2$

C. $\frac{1}{2} \log_e \frac{3}{2}$

D. $\log_e \frac{2}{3}$

Answer: B



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10. $-\left(\frac{4}{5} + \frac{4^2}{5^2 \cdot 2} + \frac{4^3}{5^3 \cdot 3} + \frac{4^4}{5^4 \cdot 4} + \dots \dots \infty\right) =$

A. $\log \frac{9}{5}$

B. $\log \frac{4}{5}$

C. $\log \left(\frac{5}{4}\right)$

D. $-\log \frac{1}{5}$

Answer: D



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11. $y = \left(x^3 + \frac{x^6}{2} + \frac{x^9}{3} + \dots \dots\right)$ then

A. $x^3 = 1 - e^{-y}$

B. $x = \log(x + y)$

C. $x^3 = e^y$

D. $x = 1 + e^y$

Answer: A



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12. If $|x| < 1$, then the coefficient of x^5 in the expansion of $(1 - x)\log_e(1 - x)$ is

A. $\frac{1}{2}$

B. $\frac{1}{4}$

C. $\frac{1}{20}$

D. $\frac{1}{10}$

Answer: C



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13. $\frac{1}{3} + \frac{1}{2 \cdot 3^2} + \frac{1}{3 \cdot 3^3} + \frac{1}{4 \cdot 3^4} + \dots \infty =$

A. $\log_e 2 - \log_e 3$

B. $\log_e 3 - \log_e 2$

C. $\log_e 6$

D. $\log_e 3 - \log_e 4$

Answer: B



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14. $\frac{x}{x+1} + \frac{1}{2} \left(\frac{x}{x+1} \right)^2 + \frac{1}{3} \left(\frac{x}{x+1} \right)^3 + \dots =$

A. $\log(1+x)$

B. $\log(1-x)$

C. $\log x$

D. $\log\left(\frac{1}{x}\right)$

Answer: A



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15. The 3rd term in $\log\left(\frac{1}{1-x}\right)$ is

A. $\frac{-x^3}{3}$

B. $\frac{x^3}{3}$

C. $\frac{x^2}{2}$

D. $-\frac{x^2}{2}$

Answer: B



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16. n^{th} term of $\log_e(6/5)$ is

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

B. $\frac{3^n}{n \cdot 5^n}$

C. $\frac{2^n}{3^n \cdot n!}$

D. $\frac{2^n}{3^n}$

Answer: B



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17. $2\log x - \log(x + 1) - \log(x - 1) =$

A. $x^2 + \frac{x^4}{2} + \frac{x^6}{3} + \dots \infty$

B. $\frac{1}{x^2} + \frac{1}{2x^4} + \frac{1}{3x^6} + \dots \infty$

C. $-\left[\frac{1}{x^2} + \frac{1}{2x^4} + \frac{1}{3x^6} + \dots \infty\right]$

D. $\frac{1}{x^2} + \frac{1}{x^4} + \frac{1}{x^6} + \dots \infty$

Answer: B



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18. If $x^2y = 2x - y$ then $y^2 + \frac{y^4}{2} + \frac{y^6}{3} + \dots \infty =$

A. $2 \log \left(\frac{1+x}{1-x} \right)$

B. $2 \log \left(\frac{1+x^2}{1-x^2} \right)$

C. $\log \left(\frac{1+x}{1-x} \right)$

D. $\log \left(\frac{1+x^2}{1-x^2} \right)$

Answer: B



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19. If higher powers of x^2 are neglected, then the value of $\log(1 + x^2) - \log(1 + x) - \log(1 - x) =$

A. x^2

B. $\frac{1}{2}x^2$

C. $2x^2$

D. $3x^2$

Answer: C

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20. If $\frac{1}{n+1} + \frac{1}{2(n+1)^2} + \frac{1}{3(n+1)^3} + \dots =$
 $\lambda \left(\frac{1}{n} - \frac{1}{2n^2} + \frac{1}{3n^3} - \dots \right)$ then $\lambda =$

A. 2

B. $n + 1$

C. 1

D. n

Answer: C



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21. Assertion (A) : coefficient x^n in $\log(1 + x)$ is $\frac{(-1)^{n-1}}{n}$ when $|x| < 1$.

Reason (R) : Coefficient of x^n in $\log(1 - x)$ is $-1/2$ when $|x| < 1$.

A. A is true, R is true $R \Rightarrow A$

B. A is true, R is true, $R \not\Rightarrow A$

C. A is true, R is false

D. A is false R is true

Answer: C



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22. Observe the following lists.

LIST - I

LIST - II

(A) 8^{th} term of $\log_e^2$ is

(1) $\log\left(\frac{n+1}{n-1}\right)$

(B) 7^{th} term of $\log_e(5/4)$ is

(2) $\frac{-1}{8}$

(C) n^{th} term of $\log_e(3/2)$ is

(3) $\frac{1}{7.4^7}$

(D) $\frac{2}{n^2+1} + \frac{1}{3}\left(\frac{2n}{n^2+1}\right)^3 + \dots$

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

The correct match for List-I from List-II is

A.

A	B	C	D
2	3	4	1

B.

A	B	C	D
2	3	1	4

C.

A	B	C	D
2	4	3	1

D.

A	B	C	D
3	2	4	1

Answer: A

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23. $x + \frac{x^3}{3} + \frac{x^5}{5} + \frac{x^7}{7} + \dots \infty =$

A. $\frac{1}{2} \log_e \left(\frac{1+x}{1-x} \right),$

B. $\log_e (1-x)$

C. $\tan h^{-1} x$

D. $\sin h^{-1} y$

Answer: A

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24. $2[7^{-1} + 3^{-1}7^{-3} + 5^{-1}7^{-5} + \dots] =$

A. $\log_e \left(\frac{4}{3} \right)$

B. $\log_e \left(\frac{3}{4} \right)$

C. $2 \log \left(\frac{3}{4} \right)$

D. $2 \log \left(\frac{4}{3} \right)$

Answer: A



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25. $2 \left[\frac{1}{2x+1} + \frac{1}{3 \cdot (2x+1)^3} + \frac{1}{5 \cdot (2x+1)^5} + \dots \cdot \infty \right] =$

A. $\log_e x$

B. $\log_e \left(\frac{1}{x} \right)$

C. $\log_e \left(\frac{x+1}{x} \right)$

D. $\log_e \left(\frac{x-1}{x} \right)$

Answer: C



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$$26. \frac{2x}{x^2 + 1} + \frac{1}{3} \left(\frac{2x}{x^2 + 1} \right)^3 + \frac{1}{5} \left(\frac{2x}{x^2 + 1} \right)^5 + \dots \cdot \infty =$$

A. $\log_e \left(\frac{x + 1}{x - 1} \right)$

B. $\log_e \left(\frac{x - 1}{x + 1} \right)$

C. $\log_e \left(\frac{1}{x - 1} \right)$

D. $\log_e \left(\frac{1}{x + 1} \right)$

Answer: A



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$$27. x = \frac{1}{3} + \frac{1}{3 \cdot 3^3} + \frac{1}{5 \cdot 3^5} + \dots$$

$$y = \frac{1}{5} + \frac{1}{3 \cdot 5^3} + \frac{1}{5 \cdot 5^5} + \dots$$

$$z = 1 + \frac{1}{3 \cdot 2^2} + \frac{1}{5 \cdot 2^4} + \frac{1}{7 \cdot 2^6} + \dots$$

Then descending order of x, y, z

A. z, y, x

B. z, x, y

C. x, y, z

D. y, z, x

Answer: B



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28. If $f(x) = 1 + x^2 + x^4 + x^6 + \dots \infty$ then $\int_0^x f(x) dx =$

A. $\log(1 - x)$

B. $\log(1 + x)$

C. $\log\left(\frac{1+x}{1-x}\right)$

D. $\frac{1}{2} \log\left(\frac{1+x}{1-x}\right)$

Answer: A



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29. Statement-I : $\frac{1}{1.2} + \frac{1}{2.2^2} + \frac{1}{3.2^3} + \dots \infty = \log_e 1/2$

Statement-II :

$$\left(\frac{1}{5} + \frac{1}{7}\right) + \frac{1}{3} \left(\frac{1}{5^3} + \frac{1}{7^3}\right) + \frac{1}{5} \left(\frac{1}{5^5} + \frac{1}{7^5}\right) + \dots + \infty = \frac{1}{2} \log 2$$

Which of the above is true

A. Only I

B. Only II

C. both I & II

D. neither I nor II

Answer: D



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30. Assertion (A) : $\frac{1}{5} + \frac{1}{3 \cdot 5^3} + \frac{1}{5 \cdot 5^5} + \frac{1}{7 \cdot 5^7} + \dots \frac{1}{2} \log\left(\frac{3}{2}\right)$

Reason (R) : If $|x| < 1$ then

$$\log_e\left(\frac{1+x}{1-x}\right) = 2\left(x + \frac{x^3}{3} + \frac{x^5}{5} + \dots\right)$$

- A. A is true, R is true and R is correct explanation of A
- B. A is true, R is true and R is not correct explanation of A
- C. A is true, R is false
- D. A is false, R is true

Answer: A



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Exercise Iii

1. $\frac{1}{1 \cdot 2 \cdot 3} + \frac{1}{3 \cdot 4 \cdot 5} + \frac{1}{5 \cdot 6 \cdot 7} + \dots$

A. $\log_e 2$

B. $\log_e 3$

C. $\log_e 5$

D. $\log_e 2 - \frac{1}{2}$

Answer: D



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2. $\frac{x}{1.2} + \frac{x^2}{2.3} + \frac{x^3}{3.4} + \dots =$

A. $1 + \frac{1-x}{x} \log(1-x)$

B. $\frac{1-x}{x} \log(1-x)$

C. $1 + \frac{1-x}{x} \log(1+x)$

D. $\frac{1-x}{x} \log(1+x)$

Answer: A

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3. The sum of the series

$$\frac{x^2}{2} + \frac{2}{3}x^3 + \frac{3}{4}x^4 + \frac{4}{5}x^5 + \dots =$$

A. $\frac{x}{1+x} + \log(1+x)$

B. $\frac{x}{1-x} + \log(1-x)$

C. $-\frac{x}{1+x} + \log(1+x)$

D. $\frac{x}{1-x} + \log(1+x)$

Answer: B

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4. The coefficient of x^6 in

$$\log \left[(1+x)^{1+x} (1-x)^{1-x} \right] =$$

A. $\frac{1}{15}$

B. $\frac{1}{30}$

C. $\frac{1}{10}$

D. $\frac{1}{45}$

Answer: A



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5. If $|x| < 1$ then coefficient of x^2 in $\frac{\log(1+x)}{(1-x)^2}$ is

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

B. 2

C. $-\frac{1}{2}$

D. 4

Answer: A



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6. Coefficient of n^{-r} in the expansion of $\log_{10}\left(\frac{n}{n-1}\right)$ is

A. $\frac{1}{r \log_e 10}$

B. $-\frac{1}{r \log_e 10}$

C. $-\frac{1}{r! \log_6 10}$

D. $\frac{1}{\log_6 10}$

Answer: A



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7. The coefficient of x^3 in $\log(1 - 5x + 6x^2)$ is

A. $\frac{8}{3}$

B. $\frac{27}{3}$

C. $\frac{-37}{3}$

D. $\frac{-35}{3}$

Answer: D



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8. A: $\frac{1}{2} - \frac{1}{2} \cdot \frac{1}{2^2} + \frac{1}{3} \cdot \frac{1}{2^3} - \frac{1}{4} \cdot \frac{1}{2^4} + \dots = \log_e \left(\frac{3}{2} \right)$

R: $\log_e(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$

A. A is true, R is true and R is correct explanation of A

B. A is true, R is true and R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: A



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