



## MATHS

### BOOKS - MAHAVEER PUBLICATION

### DEFINITE INTEGRAL

#### Question Bank

1. Evaluate the following definite integrals as limit of sums.

$$\int abx dx$$



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2. Find  $\int_0^1 e^{-1} dx$  as the limit of a sum .

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3. Find  $\int_0^2 (x^2 + 1) dx$  as the limit of a sum.

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4. Find  $\int_4^9 \sqrt{x} dx$

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5. Evaluate  $\int_{-1}^1 x^3(1 - x^2) dx$



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6. Evaluate  $\int_0^a \frac{dx}{\sqrt{a^2 - x^2}}$

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7. Evaluate  $\int_2^3 e^{-x} dx$

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8. Evaluate  $\int_1^4 e^{2x} dx$

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9.  $\int_0^{\frac{\pi}{2}} \sin x dx$

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10.  $\int_0^{\frac{\pi}{2}} \sin^2 x \cos^2 x dx$

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11. Evaluate  $\int_0^{\frac{\pi}{4}} \sec x \tan x dx$

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12.  $\int_0^{\frac{\pi}{4}} \sec^2 x dx$

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13.  $\int_0^{\frac{\pi}{2}} \frac{dx}{1 + \cos x}$

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14. Evaluate  $\int_0^{\frac{\pi}{2}} \sqrt{1 + \sin x} dx$

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15. Evaluate :  $\int_0^1 \frac{x}{\sqrt{1 + x^2}} dx$

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16. Evaluate  $\int_1^2 \left(1 - \frac{1}{x^2}\right) e^{x + \frac{1}{x}} dx$

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17. Evaluate  $\int_0^1 (6x + 1) \sqrt{3x^2 + x} dx$

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18. Evaluate  $\int_0^1 \frac{\tan^{-1} x}{(1 + x^2)} dx$

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19. Evaluate  $\int_0^{\frac{\pi}{4}} \frac{\sec^2 x}{(1 + \tan x)^3} dx$



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20.  $\int_0^{\frac{\pi}{2}} \cos^3 x \sin x dx$



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21. Evaluate  $\int_0^{\frac{\pi}{2}} \sin^7 x dx$



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22. Evaluate  $\int_0^{\sqrt{2}} \sqrt{2-x^2} dx$



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23. Evaluate  $\int_0^{\frac{\pi}{4}} \frac{dx}{\cos^2 x + 4 \sin^2 x}$

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24. Evaluate  $\int_0^1 x e^{x^2} dx = \frac{1}{2}(e - 1)$

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25. Find the value of  $\int_{\frac{\pi}{4}}^{\frac{\pi}{3}} \frac{\sin 2x}{1 - \cos 2x} dx$

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26. Evaluate:  $\int_0^1 x e^x dx$





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27. Evaluate the following :

$$\int_0^1 x \tan^{-1} x dx$$

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28. Evaluate  $\int_0^{\frac{\pi}{2}} x \cos x dx$

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29. Evaluate  $\int_0^{\pi} x^2 \sin x dx$

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30.  $\int_0^{\frac{\pi}{2}} \sin^2 x dx =$

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31. Use the idea of odd and even function to evaluate

$$\int_{-1}^1 x(1 - x^2) dx$$

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32. Using the properties of definite integral, show that

$$\int_0^{\frac{\pi}{2}} \log \tan x dx = 0$$

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33. Evaluate:  $\int_0^{\pi} \frac{x \sin x}{1 + \cos^2 x} dx$

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34.  $\int_0^{\pi} \frac{x \tan x}{\sec x + \cos x} dx$  is

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35. The value of  $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\cos x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$

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36.  $\int_{\frac{\pi}{3}}^{\frac{\pi}{6}} \frac{dx}{1 + \sqrt{\tan x}}$

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37. Evaluate  $\int_0^{\frac{\pi}{2}} \frac{\sin x}{\sin x + \cos x} dx$

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38. Evaluate:  $\int_0^{\pi} \frac{x}{a^2 \cos^2 x + b^2 \sin^2 x} dx$

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39.

Evaluate

$$\lim_{n \rightarrow \infty} \left[ \frac{1}{n+1} + \frac{1}{n+2} + \frac{1}{n+3} + \dots + \frac{1}{2n} \right]$$

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40.  $\lim_{n \rightarrow \infty} \frac{1}{n} \left[ \tan\left(\frac{\pi}{4n}\right) + \tan\left(\frac{2\pi}{4n}\right) + \dots + \tan\left(\frac{n\pi}{4n}\right) \right]$

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41. Evaluate

$$\lim_{n \rightarrow \infty} \left[ \frac{1}{n+k} + \frac{1}{n+2k} + \frac{1}{n+3k} + \dots + \frac{1}{n+nk} \right]$$

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42. Evaluate

$$\lim_{n \rightarrow \infty} n \left[ \frac{1}{n^2 + 1^2} + \frac{1}{n^2 + 2^2} + \frac{1}{n^2 + 3^2} + \dots + \frac{1}{2n^2} \right]$$

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43.  $\lim_{n \rightarrow \infty} \left[ \frac{\sqrt{n+1} + \sqrt{n+2} + \dots + \sqrt{2n}}{n\sqrt{(n)}} \right]$

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44.

Evaluate

$$\lim_{n \rightarrow \infty} \left[ \frac{1}{n+1} + \frac{1}{n+2} + \frac{1}{n+3} + \dots + \frac{1}{2n} \right]$$

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45. Evaluate  $\lim_{n \rightarrow \infty} \left[ \frac{1^6 + 2^6 + 3^6 \dots + n^6}{n^7} \right]$

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46. Choose the correct Answer of the Following Questions :

$$\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \sqrt{1 - \sin 2x} dx \text{ is equal to}$$

A.  $\sqrt{2} + 1$

B.  $2(\sqrt{2} - 1)$

C.  $1 - \sqrt{2}$

D. 0

**Answer: B**



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47. Choose the correct Answer of the Following Questions :

$$\int_0^1 \frac{1}{2x - 3} dx \text{ is equal to}$$

A.  $\frac{1}{2} \log 3$

B.  $\log 3$

C.  $-\frac{1}{2} \log 3$

D.  $2 \log 3$

**Answer: C**



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**48.** Choose the correct Answer of the Following Questions :

$\int_1^4 x^{-\frac{1}{2}} dx$  is equal to

A. -2

B.  $-\frac{7}{16}$



C. 1/2

D. 2

**Answer: A**



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**49.** Choose the correct Answer of the Following Questions :

$$\int_0^{\pi} \left( \frac{1}{1 + \sin \theta} \right) d\theta = \text{ is equal to}$$

A. 0

B. 1/2

C. 2

D. 3/2

**Answer: C**



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**50.** Choose the correct Answer of the Following Questions :

$$\int_0^{2\pi} \sqrt{1 + \sin\left(\frac{x}{2}\right)} dx =$$

A. 0

B. 2

C. 8

D. 4

**Answer: D**



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51. Choose the correct Answer of the Following Questions :

$$\int_0^{\frac{\pi}{2}} \frac{\sqrt{\cos x}}{\sqrt{\cos x} + \sqrt{\sin x}} dx =$$

A. 0

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

C.  $\frac{\pi}{4}$

D.  $2\pi$

**Answer: C**



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52. Choose the correct Answer of the Following Questions :

$$\int_0^{\frac{\pi}{2}} \frac{dx}{2 + \cos x} =$$

A.  $\frac{1}{3} \tan^{-1} \left( \frac{1}{\sqrt{3}} \right)$

B.  $\frac{2}{3} \tan^{-1} \left( \frac{1}{\sqrt{3}} \right)$

C.  $1/2$

D. 2

**Answer: B**



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**53.** Choose the correct Answer of the Following Questions :

$$\int_0^e \log x dx =$$

A. 1

B. e-1

C.  $e+1$

D. 0

**Answer: A**

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**54.** Choose the correct Answer of the Following Questions :

$$\int_0^{\sqrt{3}} \frac{dx}{1+x^2} =$$

A.  $\frac{\pi}{12}$

B.  $\frac{\pi}{6}$

C.  $\frac{\pi}{4}$

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

**Answer: A**



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**55.** Choose the correct Answer of the Following Questions :

$$\int_0^{\frac{\pi}{2}} \frac{\sin x dx}{\sin x + \cos x} =$$

A.  $\pi$

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

C.  $\frac{\pi}{4}$

D.  $\frac{\pi}{6}$

**Answer: C**



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56. Choose the correct Answer of the Following Questions :

$$\int_0^{\frac{\pi}{2}} \frac{dx}{1 + \tan x}$$

A.  $\pi$

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

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

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

**Answer: D**



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57. Choose the correct Answer of the Following Questions :

$$\int_0^{\pi} \frac{dx}{a + b \cos x}$$

A.  $\frac{\pi}{ab}$

B.  $\frac{\pi}{a^2 + b^2}$

C.  $\frac{\pi}{a^2 - b^2}$

D. 0

**Answer: C**



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**58.** Choose the correct Answer of the Following Questions :

$\int_0^{\frac{\pi}{2}} \frac{\sin x dx}{\sqrt{1 + \cos x}}$  is equal to

A.  $2(\sqrt{2} + 1)$

B.  $2(\sqrt{2} - 1)$



C.  $1 - \sqrt{2}$

D. 0

**Answer: B**



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**59.** Choose the correct Answer of the Following Questions :

$\int_0^{\infty} e^{-x} dx$  is equal to

A. -2

B. -7/16

C. 1/2

D. 1

**Answer: D**

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60. fill in the blanks.  $\int_2^3 \frac{\sqrt{x}}{\sqrt{5-x} + \sqrt{x}} dx = \underline{\hspace{2cm}}$ .

A. 0

B. 1/2

C. 2

D. 3/2

**Answer: A**

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61. Evaluate each of the following integral:  $\int_0^{\pi/2} \cos^2 x \, dx$

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

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

C.  $\left(\frac{\pi}{6}\right)$

D.  $\Pi$

**Answer: B**



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62. Choose the correct Answer of the Following Questions :

$$\int_0^2 \sqrt{4 - x^2} \, dx =$$

A. 0

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

C.  $\pi$

D.  $2\pi$

**Answer: C**

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**63.** Choose the correct Answer of the Following Questions :

$$\int_0^{\frac{1}{2}} \frac{1}{\sqrt{1-x^2}} dx =$$

A.  $\left(\frac{\pi}{6}\right)$

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

C.  $\left(\frac{\pi}{2}\right)$

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

**Answer: A**



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**64.** Choose the correct Answer of the Following Questions :

$$\int_0^{\frac{\pi}{4}} e^x \sin x dx =$$

A. 1

B. -1/2

C. 0

D. 1/2

**Answer: D**

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65. Evaluate the following :

$$\int_0^{\pi/2} \frac{\sin x}{\sin x + \cos x} dx$$

A.  $\pi$

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

C.  $\frac{\pi}{3}$

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

**Answer: D**

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66. Find the Definite Integrals :  $\int_0^1 \frac{dx}{\sqrt{4-x^2}}$

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67. Find the Definite Integrals :  $\int_0^{\frac{\pi}{4}} \frac{\sec^2 x dx}{1 + \tan^2 x}$

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68. Find the Definite Integrals :  $\int_{-\left(\frac{\pi}{4}\right)}^0 e^{\tan x} \sec^2 x dx$

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69. Find the Definite Integrals :  $\int_1^2 \frac{dx}{x} (1 + \log x)^2$



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70. Find the Definite Integrals :  $\int_0^1 x^2 e^x dx$



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71. Find the Definite Integrals :  $\int_0^{\frac{\pi}{2}} \sin^2 x \cos^3 x dx$



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72.  $\int_0^{\frac{\pi}{2}} \frac{\cos x}{1 + \sin x} dx$



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73. Find the Definite Integrals :  $\int_0^{\frac{\pi}{2}} \frac{dx}{2 + \cos x}$

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74. Find the Definite Integrals :  $\int_0^{\frac{\pi}{4}} \sqrt{1 - \sin 2x} dx$

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75. Find the Definite Integrals :  $\int_0^1 \frac{\log x}{x^2} dx$

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76. Find the Definite Integrals :  $\int_0^{\frac{\pi}{2}} x \sin x dx$

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77. Find the Definite Integrals :  $\int_0^2 x^2 dx$

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78. Find the Definite Integrals :  $\int_0^2 \frac{1}{x} dx$

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79. Find the Definite Integrals :  $\int_0^1 xe^{-x} dx$

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80. Find the Definite Integrals :  $\int_0^1 \frac{1}{(x+1)(x+2)} dx$

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81.  $\int_1^2 \frac{x}{(x+1)(x+2)} dx$

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82. Find the Definite Integrals :  $\int_1^2 e^x \left( \frac{x-1}{x^2} \right) dx$

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83.  $\int_0^1 \sqrt{\frac{1-x}{1+x}} dx$

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84. Find the Definite Integrals :  $\int_0^1 x^2 e^{x^3} dx$

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85. Evaluate the following integral:  $\int_0^1 \frac{\tan^{-1} x}{1+x^2} dx$

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86.  $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$

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87. Using the properties of definite integral Evaluate :

$$\int_0^{\frac{\pi}{2}} \frac{\sin x}{\sin x + \cos x} dx$$



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88. Using the properties of definite integral Evaluate :

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{1}{1 + \sqrt{\tan x}} dx$$



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89. Using the properties of definite integral Evaluate :

$$\int_0^{\pi} \frac{x}{1 + \sin x} dx$$



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90. By using the properties of definite integrals, evaluate

$$\int_0^{\frac{\pi}{4}} \log(1 + \tan x) dx$$

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91. Using the properties of definite integral Evaluate :

$$\int_0^3 x \sqrt{3-x} dx$$

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92. By using the properties of definite integrals, evaluate

$$\int_0^a \frac{\sqrt{x}}{\sqrt{x} + \sqrt{a-x}} dx$$

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93. By using the properties of definite integrals, evaluate the integrals  $\int_0^\pi \log(1 + \cos x) dx$

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94. Evaluate  $\int_0^{\frac{\pi}{2}} \frac{\sin x - \cos x}{1 + \sin x \cos x} dx$

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95. Using the properties of definite integral Evaluate :

$$\int_0^\pi \frac{x \tan x}{1 + \sin x} dx$$

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96. Evaluate :  $\int_0^{\pi} \frac{x \sin x}{1 + \sin x} dx$

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97. Evaluate  $\lim_{n \rightarrow \infty} \left[ \frac{1}{n} + \frac{1}{n+1} + \frac{1}{n+2} + \dots + \frac{1}{3n} \right]$

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98.  $\lim_{n \rightarrow \infty} \frac{1 + 2^4 + 3^4 + \dots + n^4}{n^5}$

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99.  $\lim_{n \rightarrow \infty} \left[ \frac{1}{n} + \frac{n^2}{(n+1)^3} + \frac{n^2}{(n+2)^3} + \dots + \frac{1}{8n} \right]$  is

equal to





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100.

Evaluate

$$\lim_{n \rightarrow \infty} n \left[ \frac{1^2}{n^3 + 1^3} + \frac{2^2}{n^3 + 2^3} + \frac{3^2}{n^3 + 3^3} + \dots + \frac{n^2}{n^3 + n^3} \right]$$



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