

Workbook



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Improper Integrals

Improper Integrals

Questions

Determine whether the following integrals converges or diverges and, if they converges, determine their values:

- | | | | |
|---|--|---|---|
| 1) $\int_1^{\infty} \frac{1}{x^4} dx$ | 2) $\int_1^{\infty} \frac{1}{\sqrt{x}} dx$ | 3) $\int_{-\infty}^0 \frac{1}{(2x-5)^5} dx$ | 4) $\int_2^{\infty} \frac{1}{\sqrt[3]{2x+1}} dx$ |
| 5) $\int_0^{\infty} \frac{1}{e^x} dx$ | 6) $\int_{-\infty}^0 e^{4x} dx$ | 7) $\int_{-1}^{\infty} \frac{x}{1+x^2} dx$ | 8) $\int_0^{\infty} xe^{-x^2} dx$ |
| 9) $\int_e^{\infty} \frac{1}{x \ln^4 x} dx$ | 10) $\int_4^{\infty} \frac{1}{x \sqrt{\ln x}} dx$ | 11) $\int_0^{\infty} \frac{1}{1+x^2} dx$ | 12) $\int_1^{\infty} \frac{e^{-\sqrt{x}}}{\sqrt{x}} dx$ |
| 13) $\int_0^{\infty} \frac{1}{1+e^x} dx$ | 14) $\int_0^{\infty} \cos(x) dx$ | 15) $\int_0^{\infty} x^2 e^{-x} dx$ | 16) $\int_1^{\infty} \frac{x}{(1+x^2)^2} dx$ |
| 17) $\int_1^{\infty} \frac{1}{(1+x)\sqrt{x}} dx$ | 18) $\int_{-\infty}^0 \frac{e^x}{3-2e^x} dx$ | 19) $\int_{-\infty}^{\infty} x^3 dx$ | 20) $\int_{-\infty}^{\infty} \frac{x}{\sqrt{x^2+4}} dx$ |
| 21) $\int_{-\infty}^{\infty} \frac{e^{-x}}{1+e^{-2x}} dx$ | 22) $\int_1^4 \frac{1}{(x-2)^{2/3}} dx$ | 23) $\int_0^2 \frac{1}{(x-1)^2} dx$ | 24) $\int_0^4 \frac{1}{x-2} dx$ |
| 25) $\int_1^{\infty} \frac{1}{x\sqrt{x^2-1}} dx$ | 26) $\int_0^1 \sin \frac{1}{x} \cdot \frac{1}{x^2} dx$ | 27) $\int_0^1 \frac{1}{x\sqrt{x^2+1}} dx$ | 28) $\int_0^1 \frac{1}{x\sqrt{x}} dx$ |

29) Find the area under the curve $y = xe^{-x}$ for $x \geq 0$

30) Find the area under the curve $y = x^2 e^{-x^3}$ for $x \geq 0$

31) Find the area under the curve $y = \frac{1}{\sqrt{x}}$ between $x=0$ and $x=4$

- 32) Find the area under the curve $y = \frac{\sin x}{\sqrt{\cos x}}$ between $x = \frac{\pi}{4}$ and $x = \frac{\pi}{2}$
- 33) Find the area above the curve $y = \ln x$ between $x = 0$ and $x = 1$
- 34) The area between the graph of $y = -\ln x$ the x -axis, and the y -axis is revolved around the x -axis. Find the volume of the solid it generates.

Answer Key

- | | | | |
|--|-------------------------------------|-----------|-----------------------------|
| 1) Converges, $\frac{1}{3}$ | 2) Diverges | | |
| 3) Converges, $-\frac{1}{5000}$ | 4) Diverges | | |
| 5) Converges, 1 | 6) Converges, $\frac{1}{4}$ | | |
| 7) Diverges | 8) Converges, 0.5 | | |
| 9) Converges, $\frac{1}{3e^3}$ | 10) Diverges | | |
| 11) Converges, $\frac{\pi}{2}$ | 12) Converges, $\frac{2}{e}$ | | |
| 13) Converges, $\ln 2$ | 14) Diverges | | |
| 15) Converges, 2 | 16) Converges, $\frac{1}{4}$ | | |
| 17) Converges, $\frac{1}{3e^3}$ | 18) Converges, $0.5(\ln 3 - 1)$ | | |
| 19) Diverges | 20) Diverges | | |
| 21) Converges, $\frac{\sqrt{2}\pi}{4}$ | 22) Converges, $3(1 + \sqrt[3]{2})$ | | |
| 23) Diverges | 24) Diverges | | |
| 25) Converges, $\frac{\pi}{2}$ | 26) Diverges | | |
| 27) Diverges | 28) Diverges | | |
| 29) 1 | 30) $\frac{1}{3}$ | 31) 4 | 32) $\frac{2}{\sqrt[4]{2}}$ |
| 33) 1 | | 34) π | |