

1. Evaluate $\int \frac{\ln(\ln(x))}{x} dx$

2. Find the interval of convergence for $\sum_{n=1}^{\infty} \frac{(-1)^n x^{2n-1}}{(2n-1)!}$

3. Solve $x \tan(y) - y' \sec(x) = 0$

4. Does the following **improper** integral, $\int_2^{\infty} \frac{\ln^4(x)}{x} dx$ converge or diverge? If convergent, evaluate.

5. Use a power series to find $\int \frac{3}{2+x^2} dx$. How many terms are needed to estimate $\int_0^{1/2} \frac{3}{2+x^2} dx$ to within 0.0001.

6. Evaluate $\int \cos(\ln(x)) dx$

7. Determine convergence or divergence.

(a) $\sum_{n=1}^{\infty} \frac{\sin(n) + 2}{2^n}$

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

(c) $\sum_{n=1}^{\infty} \frac{\sqrt[3]{n}}{n^3+1}$

(d) $\sum_{n=1}^{\infty} \frac{1}{\sqrt[n]{e}}$

8. Solve $t \frac{dy}{dt} + 2y = t^3$ with $y(1) = 0$

9. Evaluate $\int x^4(\ln(x)) dx$

10. Determine convergence or divergence. If convergent, find the sum.

(a) $\sum_{n=1}^{\infty} \frac{-1}{9n^2 + 3n - 2}$

(b) $\sum_{n=1}^{\infty} (-2)^{-n} 3^{2n}$

11. Evaluate $\int x^2 e^{-3x} dx$

ANSWERS

1) $\ln(x) (\ln(\ln(x))) - \ln(x) + C$

2) $(-\infty, \infty)$

3) $x \sin(x) + \cos(x) = \ln |\sin(y)| + C$

4) Diverges

5) $\sum_{n=0}^{\infty} \frac{3(-1)^n x^{2n+1}}{2^{n+1}(2n+1)}, \quad 4 \text{ terms}$

6) $\frac{x \sin(\ln(x)) + x \cos(\ln(x))}{2} + C$

7a) Converges

7b) Diverges

7c) Converges

7d) Diverges

8) $y = \frac{t^3}{5} - \frac{1}{5t^2}$

9) $\frac{x^5 \ln(x)}{5} - \frac{1}{25}x^5 + C$

10a) Converges to $-\frac{1}{6}$

10b) Diverges

11) $-\frac{x^2}{3}e^{-3x} - \frac{2}{9}xe^{-3x} - \frac{2}{27}e^{-3x} + C$