

Integration Strategies

1. $\int \frac{9x dx}{x^4 + x^2 + 4}$

2. $\int 5\sqrt{9 + e^x} dx$

3. $\int \frac{7x \ln x dx}{\sqrt{x^2 - 16}}$

4. $\int \frac{dt}{\sin^2 t + \cos(2t)}$

5. $\int \frac{x \sin x}{\cos^3 x} dx$

6. $\int \frac{\sec^6 x}{\tan^2 x} dx$

Limits and L'Hospital's Rule

7. $\lim_{t \rightarrow 0} \left(\frac{1}{t} - \frac{1}{t^2 + t} \right)$

8. $\lim_{x \rightarrow \infty} (\ln(3x^2 + 5) - \ln(x^2 - 5))$

9. $\lim_{x \rightarrow -\infty} (x + \sqrt{x^2 + 2x})$

10. $\lim_{x \rightarrow 0} (1 + x)^{1/x}$

11. $\lim_{x \rightarrow \infty} \arctan(x^2 - x^4)$

12. $\lim_{x \rightarrow 0} \frac{\tan x - x}{x^3}$

Improper Integrals

13. $\int_0^{\infty} \frac{7x \arctan x}{(1 + x^2)^2} dx$

14. $\int_1^{\infty} \frac{\ln x}{x^3} dx$

15. $\int_{-\infty}^{\infty} \frac{1}{1 + x^2} dx$

16. $\int_{-\infty}^{\infty} e^{-|x|} dx$

Sequences

Determine whether the sequence converges or diverges. If it converges, find its limit.

17. $a_n = \frac{(2n - 1)!}{(2n + 1)!}$

18. $a_n = \frac{\cos^2 n}{2^n}$

19. $a_n = n^2 e^{-n}$

20. $a_n = \frac{7n!}{3^n}$

21. $a_n = \frac{e^n + e^{-n}}{e^{2n} - 1}$

$$22. a_n = \left(1 + \frac{2}{n}\right)^{1/n}$$

$$23. a_n = \frac{5^n + 3^{n-1}}{8^n}$$

Series

Determine whether the series converges or diverges. If it is convergent, find the sum.

$$24. \sum_{n=1}^{\infty} \cos^k 1$$

$$25. \sum_{n=1}^{\infty} \frac{1 + 5^n}{8^n}$$

$$26. \sum_{n=1}^{\infty} \frac{3}{5^n} - \frac{2}{n}$$

$$27. \sum_{n=2}^{\infty} \frac{(-3)^{n-1}}{4^n}$$

$$28. \sum_{n=1}^{\infty} \arctan n$$