

Key

MATH 2412 Calculus II

Series Convergence Tests Exercises

Determine whether each of the following series converges or diverges. In each case, show your work and name the test used.

1. $\sum_{n=0}^{\infty} \left(\frac{1}{2^n} - \frac{1}{3^n} \right)$ Conv. Geo $ r = \frac{1}{2} < 1$ $ r = \frac{1}{3} < 1$	12. $\sum_{n=1}^{\infty} \frac{1}{n} \sin \frac{(2n-1)\pi}{2}$ Alt $(-1)^n$ Conv. AST	23. $\sum_{n=1}^{\infty} \frac{2^n}{n^2}$ Div. n^{th} term
2. $\sum_{n=1}^{\infty} \frac{2}{4n^2-1}$ Conv. LC to $\frac{1}{n^2}$	13. $1 + \frac{1}{4} + \frac{1}{9} + \frac{1}{16} + \frac{1}{25} + \dots = \frac{1}{n^2}$ Conv. p series	24. $\sum_{n=0}^{\infty} e^{-n^2}$ Conv. Ratio or Root
3. $\sum_{n=1}^{\infty} \frac{n}{\sqrt{n^2+1}}$ Div n^{th} term	14. $\sum_{n=1}^{\infty} \frac{1}{n^{5/4}}$ Conv. p series $p = 5/4 > 1$	25. $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n}$ Conv. AST
4. $\sum_{n=1}^{\infty} \frac{1}{an+b}$, where $a > 0$ Div. LC to $\frac{1}{n}$	15. $\sum_{n=1}^{\infty} \frac{(-1)^n n^2}{n^2+1}$ Div n^{th} term	26. $\sum_{n=1}^{\infty} \frac{1}{3n^2-4n+5}$ Conv. LC to $\frac{1}{n^2}$
5. $\sum_{n=2}^{\infty} \frac{n}{\ln n}$ Div. n^{th} term	16. $\sum_{n=0}^{\infty} \frac{2^n}{n!}$ Conv. Ratio	27. $\sum_{n=1}^{\infty} \frac{n^2-10}{4n^5+n^3}$ Conv. LC to $\frac{1}{n^3}$
6. $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{e^n}{e^n - e^{-n}}$ Div n^{th} term	17. $\sum_{n=1}^{\infty} \frac{\cos n\pi}{n+1}$ Alt: $(-1)^n$ Conv. AST	28. $\sum_{n=1}^{\infty} \frac{\sqrt{n}}{\sqrt{n^3+1}}$ Div. LC to $\frac{1}{n}$
7. $\sum_{n=1}^{\infty} \frac{1}{\sqrt{3n-2}}$ Div. LC or DC to $\frac{1}{\sqrt{n}}$	18. $\sum_{n=1}^{\infty} \frac{ \cos n\pi }{n+1}$ Div LC to $\frac{1}{n}$	29. $\sum_{n=1}^{\infty} \frac{4\sqrt{n}-1}{n^2+2\sqrt{n}}$ Conv. LC to $\frac{1}{n^{3/2}}$
8. $\sum_{n=1}^{\infty} \frac{1}{n^2+1}$ Conv. LC or DC to $\frac{1}{n^2}$	19. $\sum_{n=2}^{\infty} \frac{1}{n(\ln n)^3}$ Conv. Int. Test	30. $\sum_{n=1}^{\infty} \frac{n2^n+5}{4n^3+3n}$ Div. n^{th} term
9. $\sum_{n=1}^{\infty} e^{-n} \cos n$ Conv. Ratio or DC to $(\frac{1}{e})^n$	20. $3 - \frac{9}{2} + \frac{27}{4} - \frac{81}{8} + \frac{243}{16} - \dots$ Div. Geo $r = -\frac{3}{2} < -1$	31. $\sum_{n=0}^{\infty} \frac{n^2 2^{n+1}}{3^n}$ Conv. Ratio
10. $\sum_{n=0}^{\infty} \frac{4^n}{3^n+1}$ Div n^{th} term	21. $\sum_{n=1}^{\infty} \frac{1}{2+3^n}$ Conv. DC to $(\frac{1}{3})^n$	32. $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}}$ Conv. AST
11. $\sum_{n=1}^{\infty} \frac{1}{2n+1}$ Div. LC to $\frac{1}{n}$	22. $\sum_{n=1}^{\infty} \frac{1}{2+\sqrt{n}}$ Div LC to $\frac{1}{\sqrt{n}}$	33. $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}}$ Div. p series $p = 1/2 < 1$