

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.

<p>1. $\sum_{n=0}^{\infty} \left(\frac{1}{2^n} - \frac{1}{3^n} \right)$</p> <p>2. $\sum_{n=1}^{\infty} \frac{2}{4n^2 - 1}$</p> <p>3. $\sum_{n=1}^{\infty} \frac{n}{\sqrt{n^2 + 1}}$</p> <p>4. $\sum_{n=1}^{\infty} \frac{1}{an + b}$, where $a > 0$</p> <p>5. $\sum_{n=2}^{\infty} \frac{n}{\ln n}$</p> <p>6. $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{e^n}{e^n - e^{-n}}$</p> <p>7. $\sum_{n=1}^{\infty} \frac{1}{\sqrt{3n - 2}}$</p> <p>8. $\sum_{n=1}^{\infty} \frac{1}{n^2 + 1}$</p> <p>9. $\sum_{n=1}^{\infty} e^{-n} \cos n$</p> <p>10. $\sum_{n=0}^{\infty} \frac{4^n}{3^n + 1}$</p> <p>11. $\sum_{n=1}^{\infty} \frac{1}{2n + 1}$</p>	<p>12. $\sum_{n=1}^{\infty} \frac{1}{n} \sin \frac{(2n-1)\pi}{2}$</p> <p>13. $1 + \frac{1}{4} + \frac{1}{9} + \frac{1}{16} + \frac{1}{25} + \dots$</p> <p>14. $\sum_{n=1}^{\infty} \frac{1}{n^4 \sqrt{n}}$</p> <p>15. $\sum_{n=1}^{\infty} \frac{(-1)^n n^2}{n^2 + 1}$</p> <p>16. $\sum_{n=0}^{\infty} \frac{2^n}{n!}$</p> <p>17. $\sum_{n=1}^{\infty} \frac{\cos n\pi}{n + 1}$</p> <p>18. $\sum_{n=1}^{\infty} \left \frac{\cos n\pi}{n + 1} \right$</p> <p>19. $\sum_{n=2}^{\infty} \frac{1}{n(\ln n)^3}$</p> <p>20. $3 - \frac{9}{2} + \frac{27}{4} - \frac{81}{8} + \frac{243}{16} - \dots$</p> <p>21. $\sum_{n=1}^{\infty} \frac{1}{2 + 3^n}$</p> <p>22. $\sum_{n=1}^{\infty} \frac{1}{2 + \sqrt{n}}$</p>	<p>23. $\sum_{n=1}^{\infty} \frac{2^n}{n^2}$</p> <p>24. $\sum_{n=0}^{\infty} e^{-n^2}$</p> <p>25. $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n}$</p> <p>26. $\sum_{n=1}^{\infty} \frac{1}{3n^2 - 4n + 5}$</p> <p>27. $\sum_{n=1}^{\infty} \frac{n^2 - 10}{4n^5 + n^3}$</p> <p>28. $\sum_{n=1}^{\infty} \frac{\sqrt{n}}{\sqrt{n^3 + 1}}$</p> <p>29. $\sum_{n=1}^{\infty} \frac{4\sqrt{n} - 1}{n^2 + 2\sqrt{n}}$</p> <p>30. $\sum_{n=1}^{\infty} \frac{n2^n + 5}{4n^3 + 3n}$</p> <p>31. $\sum_{n=0}^{\infty} \frac{n^2 2^{n+1}}{3^n}$</p> <p>32. $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}}$</p> <p>33. $\sum_{n=1}^{\infty} \left \frac{(-1)^n}{\sqrt{n}} \right$</p>
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34. $\sum_{n=1}^{\infty} \frac{4}{n(n+2)}$	45. $\sum_{n=1}^{\infty} \frac{n}{(-2)^{n-1}}$	6. Diverges
35. $\sum_{n=0}^{\infty} \frac{n^n}{n!}$	46. $\sum_{n=1}^{\infty} \frac{(-1)^n}{\ln 2n}$	7. Diverges
36. $\sum_{n=1}^{\infty} (-1)^n \frac{\sqrt{n}}{n+1}$	47. $\sum_{n=1}^{\infty} \frac{(-1)^n}{\ln(n+1)}$	8. Converges
37. $\frac{1}{2} + \frac{2}{3} + \frac{3}{4} + \frac{4}{5} + \dots$	48. $\sum_{n=1}^{\infty} \left \frac{(-1)^n}{\ln(n+1)} \right $	9. Converges
38. $\sum_{n=0}^{\infty} \frac{n!}{3^n}$	49. $\sum_{n=1}^{\infty} \frac{(-1)^n}{n!}$	10. Diverges
39. $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{3n+2}{4n^2-3}$	50. Use partial fractions to determine the sum of the series	11. Diverges
40. $\sum_{n=1}^{\infty} \frac{n}{2^n}$	$\sum_{n=1}^{\infty} \frac{2}{4n^2-1}$.	12. Converges
41. $\sum_{n=1}^{\infty} \frac{2^n}{n^2}$	51. Determine the sum of the series	13. Converges
42. $\sum_{n=2}^{\infty} \frac{\ln n}{n+1}$	$\sum_{n=1}^{\infty} \frac{4}{n(n+2)}$.	14. Converges
43. $\sum_{n=1}^{\infty} n \left(\frac{2}{3} \right)^n$	52. Determine the sum of the series	15. Diverges
44. $\sum_{n=0}^{\infty} \frac{n!}{n3^n}$	$\sum_{n=0}^{\infty} \left(\frac{1}{2^n} - \frac{1}{3^n} \right)$.	16. Converges
	53. Determine the sum of the series	17. Converges
	$3 - 2 + \frac{4}{3} - \frac{8}{9} + \frac{16}{27} - \dots$	18. Diverges
	ANSWERS	19. Converges
	1. Converges	20. Diverges
	2. Converges	21. Converges
	3. Diverges	22. Diverges
	4. Diverges	23. Diverges
	5. Diverges	24. Converges
		25. Converges
		26. Converges
		27. Converges
		28. Diverges
		29. Converges
		30. Diverges
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		44. Diverges
		45. Converges
		46. Diverges
		47. Converges
		48. Diverges
		49. Converges
		50. 1
		51. 3
		52. $\frac{1}{2}$
		53. $\frac{9}{5}$