

Mixed Up Series Examples

Question: Converge or Diverge? Which Convergence Test(s)?

$$1. \sum_{n=1}^{\infty} \frac{n^2 + n + 1}{n^3 + n^2 + n + 1}$$

$$2. \sum_{n=1}^{\infty} \frac{\sin^2 n}{n^8 + 5}$$

$$3. \sum_{n=1}^{\infty} \frac{(-1)^n}{n^8}$$

$$4. \sum_{n=1}^{\infty} \frac{e}{n^e} + \frac{1}{e^n}$$

$$5. \sum_{n=1}^{\infty} \frac{n^2}{n^4 + 5}$$

$$6. \sum_{n=1}^{\infty} \frac{(-1)^n 4^n}{5^{n+1}}$$

$$7. \sum_{n=1}^{\infty} n^4 + 5$$

$$8. \sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n} + 1}$$

$$9. \sum_{n=1}^{\infty} \frac{n^4 + 5}{n^4 + 2}$$

$$10. \sum_{n=1}^{\infty} (-1)^n \frac{n + 1}{n^3 + n^2 + n + 1}$$

$$11. \sum_{n=1}^{\infty} \frac{1}{e^{2n}}$$

$$12. \sum_{n=1}^{\infty} \frac{6}{n^6} + \frac{1}{6^n}$$

$$13. \sum_{n=1}^{\infty} \frac{\ln 9}{n^9}$$

$$14. \sum_{n=2}^{\infty} \frac{n^9}{\ln n}$$

$$15. \sum_{n=1}^{\infty} \frac{\ln n}{n^9}$$

$$16. \sum_{n=1}^{\infty} n^3 + n^2 + n + 1$$

$$17. \sum_{n=1}^{\infty} \frac{1}{n!}$$

$$18. \sum_{n=1}^{\infty} \left(1 + \frac{5}{n^2}\right)^{n^2}$$

$$19. \sum_{n=1}^{\infty} \frac{n^6 + 3}{n^7}$$

$$20. \sum_{n=1}^{\infty} 9$$

$$21. \sum_{n=1}^{\infty} \frac{(-1)^n}{8^n}$$

$$22. -1 - \frac{1}{2} - \frac{1}{3} - \frac{1}{4} - \dots$$

$$23. \sum_{n=2}^{\infty} \frac{e^n}{\ln n}$$

$$24. \sum_{n=1}^{\infty} \arctan \left(\frac{n^7 + 1}{n^7 + 7} \right)$$

Question: Absolutely Converge, Conditionally Converge, or Diverge?
Which Convergence Test(s)?

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

$$B. \sum_{n=1}^{\infty} \frac{(-1)^n (3n)! \ln n}{(n!)^2 e^{4n} n^n n^6}$$

$$C. \sum_{n=1}^{\infty} (-1)^n \left(\frac{n+1}{n^2} \right)$$

$$D. \sum_{n=1}^{\infty} \frac{(-1)^n (2n+1)! n^n \pi^n}{(n!)^3 2^{3n}}$$

$$E. \sum_{n=1}^{\infty} (-1)^n \left(\frac{n^4 + 3n + 8}{n^9 + 5} \right)$$

$$F. \sum_{n=1}^{\infty} \frac{(-1)^n}{8n + 3}$$