

1. Find the sum of the series $\sum_{n=1}^{\infty} \left(\frac{1}{2^n} + \frac{(-1)^n}{5^n} \right)$.
2. Find the sum of the series $\sum_{n=1}^{\infty} \frac{6}{(2n-1)(2n+1)}$.
3. Express the number $1.3\overline{21} = 1.3212121\dots$ as the ratio of two integers.
4. Using the *Integral Test*, determine whether $\sum_{n=1}^{\infty} \frac{\ln n}{n}$ converges or diverges.
5. Using the *Direct Comparison Test*, determine whether $\sum_{n=1}^{\infty} \left(\frac{n}{3n+1} \right)^n$ converges or diverges.
6. Using the *Ration Test*, determine whether $\sum_{n=1}^{\infty} \frac{e^n}{n!}$ converges or diverges.
7. Using the *Root Test*, determine whether $\sum_{n=1}^{\infty} \frac{2^{2n}}{n^n}$ converges or diverges.
8. Determine whether $\sum_{n=1}^{\infty} n \sin \frac{1}{n}$ converges or diverges.

9. Does the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}}$ converge absolutely, converge conditionally, or does it diverge?
10. How many terms of the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{10^n}$ would you have to sum up to approximate its sum with an error of at most 0.00001?
11. Find the interval of convergence of $\sum_{n=0}^{\infty} \frac{x^{2n+1}}{n!}$.
12. Find the Taylor series for $\frac{1}{x+2}$ centered at $a = 0$.
13. Find the Taylor series for 2^x centered at $a = 3$.
14. Find the sum of the series $1 - 42 + \frac{42^2}{2} - \frac{42^3}{6} + \frac{42^4}{24} - \frac{42^5}{120} \pm \dots$.
15. Solve the differential equation $y' = e^{x-y}$.
16. Solve the differential equation $2y' = e^{x/2} + y$.