

# Series practice list

Determine whether each of the series is absolutely convergent, conditionally convergent, or divergent, using any convergence test:

$$(1) \sum_{n=1}^{\infty} \left(1 + \frac{1}{n}\right) 2^{-n} \quad (2) \sum_{n=1}^{\infty} \sin\left(\left(\frac{2n+1}{2}\right)\pi\right) n^{-1/2} \quad (3) \sum_{n=1}^{\infty} \frac{\ln n}{n+2}$$

$$(4) \sum_{n=1}^{\infty} (-1)^n \ln\left(\frac{n}{3n+1}\right) \quad (5) \sum_{n=1}^{\infty} \frac{(-2)^n}{n^2} \quad (6) \sum_{n=1}^{\infty} \left(\frac{1}{9}\right)^n (2n)!$$

$$(7) \sum_{n=1}^{\infty} \frac{1 \cdot 3 \cdot 5 \cdots (2n-1)}{5^n n!} \quad (8) \sum_{n=1}^{\infty} \frac{(-1)^n}{3n} \quad (9) \sum_{n=1}^{\infty} \left(\frac{-1}{3n}\right)^n$$

$$(10) \sum_{n=1}^{\infty} (-1)^n \frac{n^{2n}}{(1+2n^2)^n} \quad (11) \sum_{n=1}^{\infty} (-1)^n \frac{n}{n^4+1} \quad (12) \sum_{n=1}^{\infty} (-1)^n \frac{\ln n}{\sqrt{n}}$$

$$(13) \sum_{n=1}^{\infty} \frac{\ln n}{n^2}$$

## Extra - Rogawski problems

The following problems are drawn from the J. Rogawski textbook, p585:

For each series, state a convergence test that will show whether it converges or diverges. (If you have time, write further details for application of the test.)

$$(43) \sum_{n=1}^{\infty} \frac{2^n + 4^n}{7^n} \quad (44) \sum_{n=1}^{\infty} \frac{n^3}{n!} \quad (45) \sum_{n=1}^{\infty} \frac{n^3}{5^n}$$

$$(46) \sum_{n=2}^{\infty} \frac{1}{n(\ln n)^3} \quad (47) \sum_{n=2}^{\infty} \frac{1}{\sqrt{n^3 - n^2}} \quad (48) \sum_{n=1}^{\infty} \frac{n^2 + 4n}{3n^4 + 9}$$

$$(49) \sum_{n=1}^{\infty} n^{-0.8} \quad (50) \sum_{n=1}^{\infty} (0.8)^{-n} n^{-0.8} \quad (51) \sum_{n=1}^{\infty} 4^{-2n+1}$$

$$(52) \sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{\sqrt{n}} \quad (53) \sum_{n=1}^{\infty} \sin \frac{1}{n^2} \quad (54) \sum_{n=1}^{\infty} (-1)^n \cos \frac{1}{n}$$

$$(55) \sum_{n=1}^{\infty} \frac{(-2)^n}{\sqrt{n}} \quad (56) \sum_{n=1}^{\infty} \left(\frac{n}{n+12}\right)^n$$