MathQuest: Series

Convergence Tests

1. The sum of the series
\[
\frac{15}{2} + \frac{45}{8} + \frac{135}{32} + \frac{405}{128} + \frac{1215}{512} + \cdots
\]
(a) Exists
(b) Does not exist

2. The series \(\sum_{n=1}^{\infty} \frac{n}{10}\)
(a) Converges
(b) Diverges

3. If \(a_n \to 0\) as \(n \to \infty\), then \(\sum_{n=1}^{\infty} a_n\) converges.
(a) Always true
(b) Not always true

4. If \(a_n\) is a convergent sequence, then \(\sum_{n=1}^{\infty} a_n\) is a convergent series.
(a) True
(b) False

5. The series \(\sum_{n=1}^{\infty} \frac{1}{n^{1/2}}\)
(a) Converges
(b) Diverges

6. For what values of \(p\) does the series \(\sum_{n=1}^{\infty} \frac{1}{n^p}\) converge?
(a) This series converges for all values of $p$.
(b) This series converges only if $p > 2$.
(c) This series converges only if $p > 1$.
(d) This series converges only if $p > 0$.
(e) This series does not converge for any values of $p$.

7. The series $\sum_{n=1}^{\infty} \left( \frac{10}{n^5} + \frac{(-3)^n}{4^n} \right)$

(a) Converges
(b) Diverges

8. The series $\sum_{n=1}^{\infty} \left( \frac{1}{2^n} + \frac{1}{n} \right)$

(a) Converges
(b) Diverges

9. The series $\sum_{n=1}^{\infty} \frac{1}{n(1 + \ln n)}$

(a) Converges
(b) Diverges

10. The series $\sum_{n=1}^{\infty} \left( \frac{1}{2^n} + \frac{1}{n} \right)$

(a) Converges
(b) Diverges

11. Does the series $\sum_{n=1}^{\infty} \frac{100}{n^2 + 2}$ converge?

(a) Yes, this series converges.
(b) No, this series does not converge.
(c) It is impossible to tell.

12. If $a_n > b_n$ for all $n$ and $\sum b_n$ converges, then
(a) $\sum a_n$ converges
(b) $\sum a_n$ diverges
(c) Not enough information to determine convergence or divergence of $\sum a_n$

13. The best way to test the series $\sum_{n=1}^{\infty} \frac{\ln n}{n}$ for convergence or divergence is

(a) Looking at the sequence of partial sums
(b) Using rules for geometric series
(c) The Integral Test
(d) Using rules for $p$-series
(e) The Comparison Test
(f) The Limit Comparison Test

14. Does the series $\sum_{n=1}^{\infty} \frac{\ln(n)}{n}$ converge?

(a) This series converges.
(b) This series diverges.
(c) It is impossible to tell.

15. The series $\sum_{n=1}^{\infty} \frac{\cos^2 n}{n^2 + 1}$

(a) Converges
(b) Diverges

16. The series $\sum_{n=1}^{\infty} (n^{-1.4} + 3n^{-1.2})$

(a) Converges
(b) Diverges

17. The series $\sum_{n=1}^{\infty} \frac{1}{ne^n}$

(a) Converges
(b) Diverges
18. The series \[ \sum_{n=1}^{\infty} \frac{(n-1)!}{5^n} \]

(a) Converges
(b) Diverges

19. Does the series \[ \sum_{n=1}^{\infty} \frac{n^3}{3^n} \] converge?

(a) This series converges.
(b) This series diverges.
(c) It is impossible to tell.

20. Does the series \[ \sum_{n=1}^{\infty} \frac{n!}{(2n)!} \] converge?

(a) This series converges.
(b) This series diverges.
(c) It is impossible to tell.

21. Does the series \[ \sum_{n=1}^{\infty} \frac{(-1)^n}{n} \] converge?

(a) This series converges.
(b) This series diverges.
(c) It is impossible to tell.