

# AP Calculus BC

## Infinite Series

### Direct and Limit Comparison Tests

Name \_\_\_\_\_

Use the Direct Comparison Test to determine the convergence or divergence of the series.

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

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

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

4.  $\sum_{n=0}^{\infty} \frac{1}{3^n + 1}$

6.  $\sum_{n=0}^{\infty} \frac{3^n}{4^n + 5}$

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

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

9.  $\sum_{n=0}^{\infty} \frac{1}{n!}$

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

11.  $\sum_{n=1}^{\infty} \frac{4^n}{3^n - 1}$

Use the Limit Comparison Test to determine the convergence or divergence of the series.

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

13.  $\sum_{n=1}^{\infty} \frac{2}{3^n - 5}$

14.  $\sum_{n=0}^{\infty} \frac{1}{\sqrt{n^2 + 1}}$

15.  $\sum_{n=3}^{\infty} \frac{3}{\sqrt{n^2 - 4}}$

16.  $\sum_{n=3}^{\infty} \frac{2n^2 - 1}{3n^5 + 2n + 1}$

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

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

19.  $\sum_{n=0}^{\infty} \frac{1}{n\sqrt{n^2 + 1}}$

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

21.  $\sum_{n=3}^{\infty} \sin\left(\frac{1}{n}\right)$

In exercise 22-28, test for convergence or divergence using each test at least once. Identify which test you used.

(a) nth term Test for divergence

(d) Integral Test

(b) p-test

(e) Direct Comparison Test

(c) Geometric Series Test

(f) Limit Comparison Test

$$22. \sum_{n=1}^{\infty} \frac{\sqrt{n}}{n}$$

$$23. \sum_{n=0}^{\infty} 5 \left( -\frac{1}{5} \right)^n$$

$$24. \sum_{n=1}^{\infty} \frac{1}{3^n + 1}$$

$$25. \sum_{n=4}^{\infty} \frac{1}{3n^2 - 2n - 15}$$

$$26. \sum_{n=1}^{\infty} \frac{n}{2n + 3}$$

$$27. \sum_{n=1}^{\infty} \frac{n}{(n^2 + 1)^2}$$