

## 11.6 Videos Guide

### 11.6a

- The Ratio Test:

(i) If  $\lim_{n \rightarrow \infty} \left| \frac{a_{n+1}}{a_n} \right| = L < 1$ , then the series  $\sum a_n$  is convergent

(ii) If  $\lim_{n \rightarrow \infty} \left| \frac{a_{n+1}}{a_n} \right| = L > 1$  or is  $\infty$ , then the series  $\sum a_n$  is divergent

(iii) If  $\lim_{n \rightarrow \infty} \left| \frac{a_{n+1}}{a_n} \right| = 1$ , the Ratio Test is inconclusive

Exercises:

Use the Ratio Test to determine whether the series is convergent or divergent.

### 11.6b

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

### 11.6c

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

### 11.6d

- $\frac{2}{3} + \frac{2 \cdot 5}{3 \cdot 5} + \frac{2 \cdot 5 \cdot 8}{3 \cdot 5 \cdot 7} + \frac{2 \cdot 5 \cdot 8 \cdot 11}{3 \cdot 5 \cdot 7 \cdot 9} + \dots$

### 11.6e

- The Root Test:

(i) If  $\lim_{n \rightarrow \infty} \sqrt[n]{|a_n|} = L < 1$ , then the series  $\sum a_n$  is convergent

(ii) If  $\lim_{n \rightarrow \infty} \sqrt[n]{|a_n|} = L > 1$  or is  $\infty$ , then the series  $\sum a_n$  is divergent

(iii) If  $\lim_{n \rightarrow \infty} \sqrt[n]{|a_n|} = 1$ , the Root Test is inconclusive

Exercises:

- Use the Root Test to determine whether the series is convergent or divergent.
  - $\sum_{n=1}^{\infty} \frac{(-2)^n}{n^n}$
  - $\sum_{n=1}^{\infty} \left( -\frac{2n}{n+1} \right)^{5n}$

### 11.6f

Exercises:

- Use any test to determine whether the series is absolutely convergent, conditionally convergent, or divergent.

○  $\sum_{n=1}^{\infty} \left( \frac{1-n}{2+3n} \right)^n$

○  $\sum_{n=1}^{\infty} \frac{\sin(n\pi/6)}{1+n\sqrt{n}}$