

## 3-2 Videos Guide

### 3-2a

- Introduction to series
- Partial sums
  - $s_n = a_1 + a_2 + a_3 + \cdots + a_n$
- Sequence of partial sums
  - $\{s_n\} = s_1, s_2, s_3, \cdots, s_n$
- Convergence of a series
  - If the sequence  $\{s_n\}$  is convergent and the limit  $\lim_{n \rightarrow \infty} s_n = s$  exists as a finite real number then the associated series  $\sum a_n$  is convergent, and the sum of the series is  $\sum_{n=1}^{\infty} a_n = s$
- Convergence of a geometric series
  - $\sum_{n=1}^{\infty} a r^{n-1}$  is convergent if  $|r| < 1$  and divergent otherwise. If  $|r| < 1$ , then  $S = \frac{a}{1-r}$

### 3-2b

Theorem (statement and proof):

- If  $\sum_{n=1}^{\infty} a_n$  is convergent, then  $\lim_{n \rightarrow \infty} a_n = 0$ .
- Divergence Test:  
If  $\lim_{n \rightarrow \infty} a_n$  does not exist or if  $\lim_{n \rightarrow \infty} a_n \neq 0$ , then the series  $\sum_{n=1}^{\infty} a_n$  is divergent.

### 3-2c

Exercises:

- Determine whether the series is convergent or divergent. If it is convergent, find its sum.  
 $\frac{1}{3} + \frac{2}{9} + \frac{1}{27} + \frac{2}{81} + \frac{1}{243} + \frac{2}{729} + \cdots$
- Determine whether the series is convergent or divergent by expressing  $s_n$  as a telescoping sum. If it is convergent, find its sum.

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

### 3-2d

Exercises:

- Find the values of  $x$  for which the series converges. Find the sum of the series for those values of  $x$ .

$$\sum_{n=1}^{\infty} (x + 2)^n$$

- Express the number as a ratio of integers.  
 $10.1\overline{35} = 10.135353535 \dots$
- A patient is injected with a drug every 12 hours. Immediately before each injection the concentration of the drug has been reduced by 90% and the new dose increases the concentration by 1.5 mg/L.
  - a) What is the concentration after three doses?
  - b) If  $C_n$  is the concentration after the  $n$ th dose, find a formula for  $C_n$  as a function of  $n$ .
  - c) What is the limiting value of the concentration?