

# Calculus BC

## Section 9.1 - Sequences

- Obj:
- List the terms of a sequence
  - Determine whether a sequence converges or diverges
  - Write a formula for the nth term of a sequence

Def:- A sequence  $\{a_n\}$  **converges** if  $\lim_{n \rightarrow \infty} a_n = L$

that is, the limit of the terms goes to a value  $L$

- A sequence  $\{a_n\}$  **diverges** if  $\lim_{n \rightarrow \infty} a_n$  does not exist,

i.e., the limit goes to  $\infty$  or does not approach a unique  $L$

1. List the terms of each sequence and state whether the sequence converges or diverges

a)  $\{a_n\} = \left\{ \frac{1}{n} \right\}$

b)  $\{a_n\} = \{(-1)^n\}$

c)  $\{a_n\} = \left\{ \left( \frac{2}{3} \right)^{2n+1} \right\}$

$$\text{d) } \{a_n\} = \left\{ \frac{n}{3-2n} \right\}$$

$$\text{e) } \{a_n\} = \left\{ \frac{n^2}{3^n - 1} \right\}$$

$$\text{f) } \{a_n\} = \left\{ \left( 1 + \frac{1}{n} \right)^n \right\}$$

$$\text{g) } \{a_n\} = \left\{ (-1)^n \frac{1}{n!} \right\}$$

2. Find the nth term of each sequence

a)  $\frac{1}{2}, \frac{3}{4}, \frac{9}{8}, \frac{27}{16}, \dots$        $n$  is a natural number

b)  $\frac{1}{8}, -\frac{1}{4}, \frac{1}{2}, -1, 2, -4, \dots$

Def: A sequence is **monotonic** if it is:

a) nondecreasing  $a_n \leq a_{n+1}$

or

b) nonincreasing  $a_n \geq a_{n+1}$