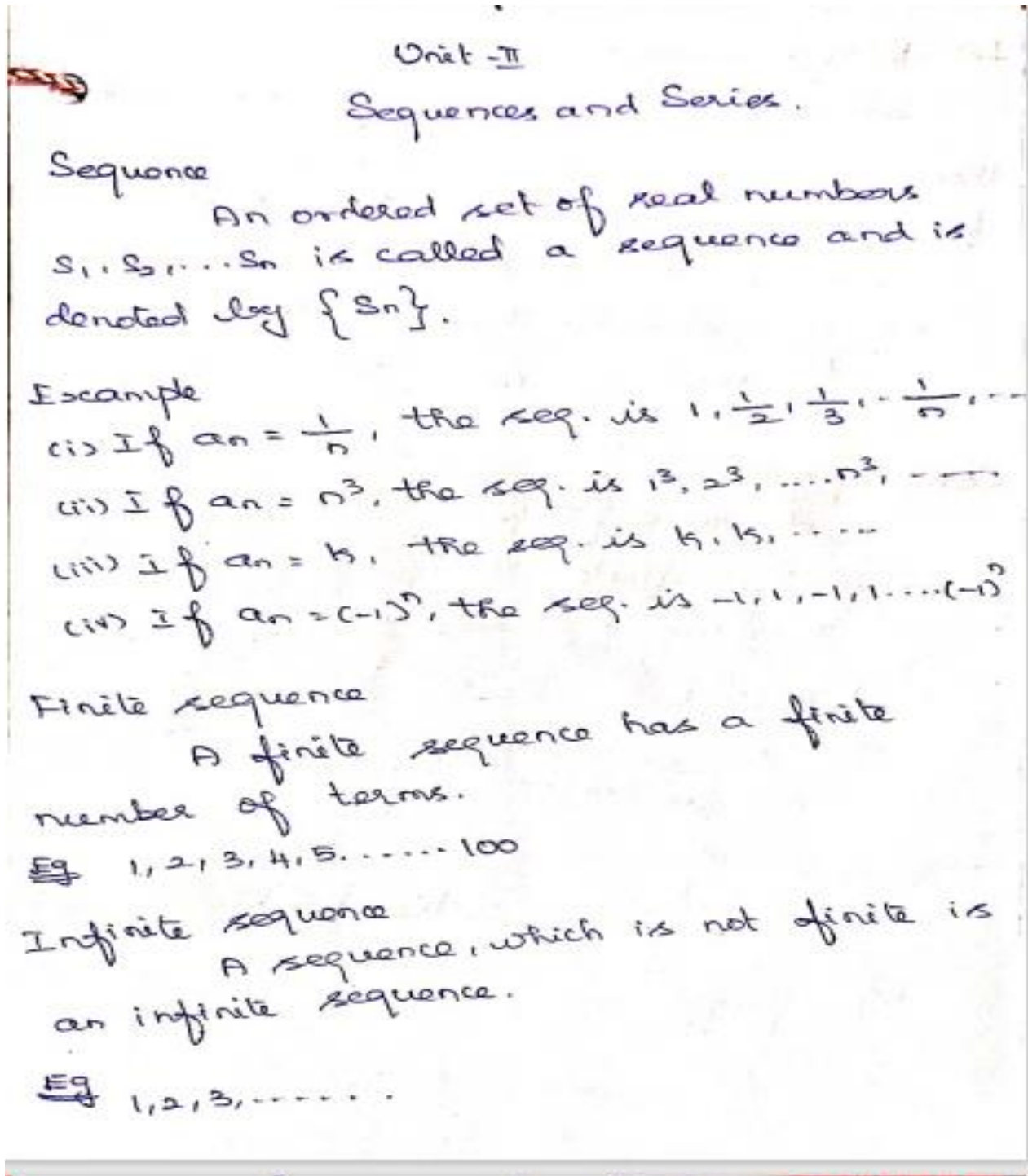




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TOPIC: 2.1 – SEQUENCES – DEFINITIONS AND EXAMPLES





Limit of a sequence

Let $\{s_n\}$ be the sequence of real numbers.
Then s_n approaches the limit L as infinity, if
for every $\epsilon > 0$, \exists a +ve integer $N \ni$
 $|s_n - L| < \epsilon$ ($n \geq N$).

If s_n approaches the limit L , then

$$\lim_{n \rightarrow \infty} s_n = L$$

Convergence

A sequence $\{s_n\}$ is said to be convergent
if it has a finite limit
i.e., $\lim_{n \rightarrow \infty} s_n = L$

Eg. $\left\{ \frac{1}{n^2} \right\}$

$$\lim_{n \rightarrow \infty} \frac{1}{n^2} = 0.$$

Divergence

If $\lim_{n \rightarrow \infty} s_n = \infty$, then $\{s_n\}$ is divergent

Eg. $\{n\}$.

$$\lim_{n \rightarrow \infty} n = \infty.$$



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Oscillatory

Defn) If $\lim_{n \rightarrow \infty} S_n$ is not unique (oscillates finitely) or $\pm \infty$ (oscillates infinitely) then $\{S_n\}$ is called an oscillatory sequence.

Eg

i) $\{(-1)^n\}$.
oscillates finitely because $\lim_{n \rightarrow \infty} (-1)^n = \begin{cases} 1, & n \text{ even} \\ -1, & n \text{ odd} \end{cases}$

ii) $\{(-1)^n \cdot n^2\}$.
oscillates infinitely because $\lim_{n \rightarrow \infty} (-1)^n \cdot n^2 = \pm \infty$

Bounded sequence:
A sequence $\{S_n\}$ is said to be bounded if \exists a number k such that $S_n < k, \forall n$.

Eg 1, 2, 3, 1, 2, 3

Monotonic sequence
A sequence $\{S_n\}$ is said to increase steadily or to decrease steadily according as $S_{n+1} \geq S_n$ or $S_{n+1} \leq S_n$ for all values of n .

Both increasing & decreasing sequence are called monotonic sequence.

Eg 1, 5, 10, 15
 $1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}$

