1. Find the limits of the following sequences if they exist. Else explain why they do not exist.

   (i) $\dfrac{\cos n}{n}$

   (ii) $\dfrac{\sin n^2}{\sqrt{n}}$

   (iii) $\dfrac{n^2}{n-3}$

2. Find the infimum and supremum of $\{\dfrac{3n+7}{n} \mid n \in \mathbb{N}\}$.

3. Find the infimum and supremum of $\{\dfrac{1}{n} - \dfrac{1}{m} \mid n, m \in \mathbb{N}\}$.

4. Give examples of following type of sequences.

   (i) Bounded but not convergent

   (ii) Monotone but not bounded

   (iii) Monotone but not Cauchy