**Department of Mathematics, Bennett University**
**Engineering Calculus (EMAT101L)**
**Tutorial Sheet 1**

---

1. Show that there is no rational number whose square is 2.

2. Show that $\sqrt{8}$ is not a rational number.

3. Find the solution set of the following inequality $\mid \frac{x+3}{2x-6} \mid \leq 1$.

4. Find $sup\ S$ and $inf\ S$, where

   (a) $S = \left\{ \frac{1}{n} : n \in \mathbb{N} \right\}$.

   (b) $S = \left\{ -\frac{1}{n} : n \in \mathbb{N} \right\}$.

   (c) $S = \left\{ \frac{(-1)^n}{n} : n \in \mathbb{N} \right\}$.

   (d) $S = \left\{ 1 + \frac{(-1)^n}{n} : n \in \mathbb{N} \right\}$.

   (e) $S = \left\{ x \in \mathbb{R} : x^2 < 1 \right\}$.

   (f) $S = \left\{ x \in \mathbb{R} : x^2 - 6x + 3 < 0 \right\}$.

   (g) $S = \left\{ \frac{1}{m} + \frac{1}{n} : m, n \in \mathbb{N} \right\}$.

   (h) $S = \left\{ (-1)^m + \frac{1}{n} : m, n \in \mathbb{N} \right\}$.

   In question 4, which of these (i.e $sup\ S$, $inf\ S$) belongs to the set $S$?

5. Let $S$ be a non-empty bounded subset of $\mathbb{R}$ with $sup\ S = M$ and $inf\ S = m$. Prove that the set $T = \{|x - y|, x, y \in S\}$ is bounded above.

6. Give examples of sets which are:

   (a) Bounded.

   (b) Not bounded.

   (c) Bounded below but not bounded above.

   (d) Bounded above but not bounded below.