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

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1. (a) If $a_1 = 1$ and $a_{n+1} = \dfrac{2 + a_n}{1 + a_n}$ $\forall\ n \in \mathbb{N}$, then compute a_2, a_3, a_4 and a_5.

   (b) If $a_1 = 5$ and $a_{n+1} = 2 + \frac{1}{a_n}$ $\forall\ n \in \mathbb{N}$, then compute a_3.

2. Compute maximum, minimum, supremum and infimum (if they exist) of the following sets. Which of these belongs to the set? Also check whether these sets are bounded or not.

   (a) $A = \{-1, -\frac{1}{2}, -\frac{1}{3}, -\frac{1}{4}, \cdots\}$.
   (b) $A = \{x \in \mathbb{R} : x^2 < 5\}$.
   (c) $A = \left\{\frac{(-1)^n}{n} : n \in \mathbb{N}\right\}$.
   (d) $A = \{1 + (-1)^n : n \in \mathbb{N}\}$.
   (e) $A = \left\{\frac{n}{n+1} : n \in \mathbb{N}\right\}$.
   (f) $A = \left\{n + \frac{(-1)^n}{n} : n \in \mathbb{N}\right\}$.
   (g) $A = \{\sin\left(\frac{n\pi}{3}\right) : n \in \mathbb{N}\}$.
   (h) $A = \left\{\frac{1}{n+m} : n, m \in \mathbb{N}\right\}$.
   (i) $A = \left\{\frac{1}{n} | \text{ and } n \text{ is prime}\right\}$.
   (j) $A = \{x \in \mathbb{R}^+ : x^2 < 3\}$.
   (k) $A = \{x \in \mathbb{R} : |x - 2| < 1\}$.

3. What can you say about a nonempty subset A of real numbers for which $\sup A = \inf A$.

4. Give examples of sets which are:
   (i) bounded (ii) Not bounded (iii) Bounded below but not bounded above
   (iv) Bounded above but not bounded below.