1. Let $\mathbb{R}$ be set of real numbers. Let $f : \mathbb{R} \to \mathbb{R}$. Decide which of the following statements are true or false.
   (a) If f is increasing[1] then f is injective.
   (b) If f is increasing then f has an inverse.
   (c) If f is surjective then f is unbounded.
   (d) If f is unbounded then f is surjective.

2. $f : (0, 1) \to \mathbb{R}$ be given by

$$f(x) = \begin{cases} \frac{2x-1}{2x} & \text{if } x \le \frac{1}{2}. \\ \frac{2x-1}{2-2x} & \text{if } x \ge \frac{1}{2}. \end{cases}$$

   Decide if f is a bijection.

3. Let $\mathbb{N}$ be the set of natural numbers.
   (a) Show that $n < 2^n$.
   (b) There is an $a \in \mathbb{N}$ and $b \in \mathbb{N}$ such that $n = 2^{a-1}(2b - 1)$
   (c) Show that $\text{Card}(\mathbb{N}) = \text{Card}(\mathbb{N} \times \mathbb{N})$

4. Decide if Card $(A) <$ Card (B) , Card $(A) >$ Card (B), or Card $(A) =$ Card (B) when
   (a) $A = (0, 1)$ and $B = [0, 1]$
   (b) $A = \mathbb{N}$ and $B = \mathbb{R}$.

[1] i.e. $f(x) < f(y)$ whenever $x, y \in R$ and $x < y$