

Pledge: *I pledge my honor that I have abided by the Stevens Honor System.* -Eric Altenburg

1: Prove that, given any two real numbers x and y such that $x < y$, there exists an irrational number z such that $x < z < y$.

2: Let $S \subset \{1, 2, \dots, 1000\}$ be a set of 100 natural numbers. Prove that there exists distinct nonempty subsets $X, Y \subset S$ such that the sum of the elements of X equals the sum of the elements of Y .

3: Make a conjecture about which numbers $n \in \mathbb{N}$ can be expressed as a sum of two or more consecutive natural numbers. (Note that the numbers in the sum don't have to start at 1. For example, 12 is such a number since $12 = 3 + 4 + 5$.) Then prove your conjecture.
