M101 - Mathematics I
Quiz 1 (Maximum Marks: 15 Marks)

1. Let $A = \mathbb{N} \times \mathbb{N}$, where $\mathbb{N}$ is the set of natural number. Define a relation $\sim$ on A by
$$(a, b) \sim (c, d) \Leftrightarrow b - a = d - c.$$
   (a) Show that $\sim$ is an equivalence relation on A.
   (b) Find the elements of the equivalence class of $(1, 2)$.
   (c) Think $A = \mathbb{N} \times \mathbb{N}$ as the points in the first quadrant of the Cartesian plane with both coordinates are natural numbers. Describe the equivalence classes pictorially. [3+2+3]

2. Let E be the set of all even natural numbers and O be the set of all odd natural numbers. Construct a bijection (one-one and onto function) from E to O. [4]

3. Recall that a set A is said to be countable if A is a finite set or there is a bijection between $\mathbb{N}$ and A. Prove that every subset of $\mathbb{N}$ is countable.
(Hint: Every non-empty subset of $\mathbb{N}$ contains a least element.) [8]

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