Computability Assignment
Year 2013/14 - Number 1

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1 Question

Define a binary property $p(x, y)$ over natural numbers that satisfies both the requisites:

1. $\forall x \in \mathbb{N}.\exists y \in \mathbb{N}.p(x, y)$ and
2. *it is false that* $\forall y \in \mathbb{N}.\exists x \in \mathbb{N}.p(x, y)$

Provide a definition for p, and a proof for the above claims.

1.1 Answer

Write your answer here.

The binary property is "equal to".

For the first requisite, $\forall x \in \mathbb{N}.\exists y \in \mathbb{N}.p(x, y)$, $\forall x \in \mathbb{N}.\exists y \in \mathbb{N}.x = y$. Each of the members x belonging to the domain $\mathbb{N}$, it is true that there is a member in the range which equals to each of the corresponding members in the domain. For example, taking x in the domain to be 1, there exists a corresponding y in the range which has a value of 1, and so on for all the members x in the set of natural numbers.

At the same time, $itisfalsethat \forall y \in \mathbb{N}.\exists x \in \mathbb{N}.p(x, y)$ implies $\forall y \in \mathbb{N}.\exists x \in \mathbb{N}.\text{Not}p(x, y)$. It is true that for all members y of the range, there exists a corresponding member x in the domain for which the property $p(x, y)$ does not exist. For example, taking y in the range to be 4, there exists an x in the domain such as 1 which is not equal to 4 in the range. This happens for all members in the range belonging to the set of natural numbers.