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

One property can be $p(x, y) = x < y$.

$\forall x \in \mathbb{N}.\exists y \in \mathbb{N}.p(x, y)$ is true because alwas exists an $y \in N$ such that $x < y$ because natural numbers N are infinite.

But if we take $y = 0$ we cannot find an $x \in N$ such that $x < y$ so the requisite $\forall y \in N.\exists x \in N.p(x, y)$ is FALSE.