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

We can define $p(x, y) := x = \sqrt{y}$.

1. $\forall x \in \mathbb{N}$ we can define $y = x^2$ and this $y \in \mathbb{N}$;

2. $\forall y \in \mathbb{N}$ we have that $x = \sqrt{y}$ but it is possible that $\sqrt{y} \notin \mathbb{N}$. (For example: if we choose $y = 5 \Rightarrow \sqrt{5} \notin \mathbb{N}$).