Philadelphia University

Department of Basic Sciences

Exam 2 **Set Theory** **24–04–2013**

1. Let $R = \{(a, b) \in \mathbb{N} \times \mathbb{N} \mid a + b \text{ is odd}\}$.
   (a) Is R reflexive? Why or why not?
   (b) Is R symmetric? Why or why not?
   (c) Is R anti-symmetric? Why or why not?
   (d) Is R transitive? Why or why not?
2. Let $R = \{(a, b) \in \mathbb{R} \times \mathbb{R} \mid a \leq b\}$. Prove that R is a partial order relation.
3. Use contradiction to prove that $\sqrt[3]{2}$ is an irrational number.
4. Use induction to prove that $5^{2n} - 4^n$ is a multiple of 3 for all $n \in \mathbb{N}$.

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