Philadelphia University

Department of Basic Sciences

Exam 1 **Set Theory** **24–03–2014**

1. Find the elements of the set A.
   (a) $A = \{x \in \mathbb{R} \mid x^2 = 9\} \oplus \{1, 2, 3\}$
   (b) $A = \{\frac{a}{2} \mid a \in \mathbb{N}\} - \{x \in \mathbb{Q} \mid x \geq 2\}$
   (c) $A = \{3n \mid n \in \mathbb{N}\} \cap \{x \in \mathbb{Z} \mid 0 \leq x \leq 9\}$
   (d) $A = \{X \in P(\{1, 3\}) \mid |X| = 1\}$
2. Prove the equivalent statement $(p \vee q) \to r \equiv (p \to r) \wedge (q \to r)$.
3. Prove that the number x is odd if and only if the number $3x^2 - 4x - 5$ is even.
4. Use contrapositive to prove that if $x^2 - 7$ is irrational, then $x - 7$ is also irrational.
5. Use three cases to prove that the number $x^2 - 2$ is not a multiple of 3 for any integer x.

–Amin Witno