Philadelphia University

Department of Basic Sciences

Exam 2 **Set Theory** **21–12–2010**

Solutions must be complete in order to receive full credit.

1. Prove using induction for all integers $n \geq 1$.

$$2 + 4 + 6 + 8 + \cdots + 2n = n^2 + n$$

2. Prove using truth table or Venn diagrams.

$$(A \oplus B) \oplus B = A$$

3. Let $A = \{1, 2, 3, 4\}$ and $R = \{(1, 1), (1, 3), (2, 2), (2, 4), (3, 1), (4, 4)\}$. For this relation R,
   (a) why is reflexive false?
   (b) why is symmetric false?
   (c) why is anti-symmetric false?
   (d) why is transitive false?

4. Let $A = \{0, 2, 3, 6, 7, 8, 10\}$ and $R = \{(a, b) \in A \times A \mid a \bmod 3 = b \bmod 3\}$. Prove that R is an equivalence relation on A and find the equivalence classes.

–Amin Witno