

PHILADELPHIA UNIVERSITY  
DEPARTMENT OF BASIC SCIENCES

Exam 1

Set Theory

01-04-2015

- Find the elements of the set  $A$ .
  - $A = \{1, 2, 3, 4\} \oplus \{3, 4, 5, 6\}$
  - $A = \{x \in \mathbb{N} \mid x^2 < 10\} \cup \{x \in \mathbb{R} \mid x^2 = 4\}$
  - $A = \{2n \mid n \in \mathbb{Z}\} - \{x \in \mathbb{Z} \mid x^2 \geq 3\}$
  - $A = P(\{2, 5\}) \cap P(\{2, 3, 4\})$
- Prove that  $(P \vee Q) \rightarrow R \equiv (P \rightarrow R) \wedge (Q \rightarrow R)$ .
- Prove that the product of two numbers is odd if and only if both of them are odd.
- Use proof by contrapositive to prove that if  $x^2 + x - 1$  is irrational, then  $x - 1$  is irrational.
- Use proof by cases to prove that the number  $x^3 - 7x$  is a multiple of 3 for any integer  $x$ .

-Amin Witno