

PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Final Exam

Set Theory

07–06–2010

Choose 5 problems only.

1. Is the following argument valid? Prove it.
Premise 1: Either n is odd or n is prime.
Premise 2: If n is even then n is composite.
Conclusion: n is composite if and only if n is odd.
2. Prove that $x^2 - 8x + 5$ is odd if and only if x is even.
3. Prove that $13^{2n} + 6$ is divisible by 7 for every integer $n \geq 0$.
4. Prove that $\sqrt{5}$ is irrational.
5. Let $A = \{1, 2, 3, 4\}$ and

$$R = \{(X, Y) \mid |X| = |Y|\} \subseteq P(A) \times P(A)$$

Prove that R is an equivalence relation and find the equivalence classes.

6. Let $A = \{2n \mid n \in \mathbb{Z}\}$ and $B = \{5n \mid n \in \mathbb{Z}\}$. Prove that $|A| = |B|$.

–Amin Witno