Introduction to Mathematical Reason | MATH 300 Test #2 | March 11, 2010

Name:_____ R. Hammack Score:_____

Directions The purpose of this very brief test is to check your understanding of the three main methods of proving conditional statements. Prove the following statements. In each case, work strictly from the definitions.

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1. If a is an odd integer, then $a^2 + 4a + 7$ is even.

2. Suppose $a, b \in \mathbb{Z}$. If $25 \nmid ab$, then $5 \nmid a$ or $5 \nmid b$.

3. Suppose $a, b \in \mathbb{R}$. If a is rational and ab is irrational, then b is irrational.

4. Suppose $a, b, c \in \mathbb{Z}$ and $n \in \mathbb{N}$. If $a \equiv b \pmod{n}$ and $a \equiv c \pmod{n}$, then $a^2 \equiv bc \pmod{n}$. [Suggestion: Direct proof may be easiest.]