Introduction to Mathematical Reason	Test # 3 MATH 300	April 8, 2008

Name: _____ R. Hammack Score: _____

Directions: Please answer the questions in the space provided. To get full credit you must show all of your work. Use of calculators and other computing or communication devices is not allowed on this test.

1. Suppose $a, b \in \mathbb{Z}$. Prove that $(a-3)b^2$ is even if and only if a is odd or b is even.

2. Suppose A and B are sets. Prove that $\mathscr{P}(A \cap B) = \mathscr{P}(A) \cap \mathscr{P}(B)$.

3. Suppose A, B and C are sets. If $B \subseteq C$, then $A \times B \subseteq A \times C$.

4. Prove by induction: If $n \in \mathbb{N}$, then $6|(n^3 - n)$.

FOR THE PROBLEMS ON THIS PAGE:
Decide if the statement is true or false. If it is true, prove it; if it is false, give a counterexample.

(a) Let A and B be sets. If $A - B = B - A$, then $A - B = \emptyset$.

(b) For every two sets A and B, $\mathscr{P}(A \cup B) = \mathscr{P}(A) \cup \mathscr{P}(B)$.

(c) Suppose A, B, C and D are sets. If $A \times B \subseteq C \times D$, then $A \subseteq C$ and $B \subseteq D$.