Introduction to	Test $\#2$	October 22, 2007
Mathematical Reason	MATH 300	
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. Consider the sets $A=\{n\in\mathbb{Z}:24|n\},\ B=\{n\in\mathbb{Z}:3|n\}$ and $C=\{n\in\mathbb{Z}:4|n\}.$ Prove that $A\subseteq B\cap C.$

2. Suppose x and y are real numbers. Prove the following statement. If $x^2-4x=y^2-4y$ and $x\neq y,$ then x+y=4.

. 3. Suppose $A,\,B,$ and C are sets, and $C\neq\emptyset.$ Prove the following statement.

If $B \times C = A \times C$, then A = B.

4. Suppose x and y are nonzero real numbers. Use proof by contradiction to prove the following result. If x is rational and y is irrational, then xy is irrational.

FOR THE PROBLEMS ON THIS PAGE:

Decide if the statement is true or false. If it is true, prove it. If it is false, disprove it.

5. If a and b are integers, then $(a+b)^3 \equiv a^3 + b^3 \pmod{3}$.

6. Suppose a, b and c are integers. If ab, ac and bc are all even, then a, b and c are all even

7. For all integers a and b, if $a \equiv b \pmod{56}$, then $a \equiv b \pmod{8}$.