MATH 310: Homework 4 **Due Monday 7/23/2012**

---

1. Let $a, b \in \mathbb{Z}$. Prove that if $a|b$ and $b|a$ then $a = \pm b$.
2. Let $x, y \in \mathbb{Z}$. Prove that if $3 \nmid x$ and $3 \nmid y$ then $3|(x^2 - y^2)$.
3. Show that if a is an odd integer then $a^2 \equiv 1 \pmod 8$.
4. Let $m, n \in \mathbb{Z}$. Prove that if $n \equiv 1 \pmod 2$ and $m \equiv 3 \pmod 4$ then $n^2 + m \equiv 0 \pmod 4$.
5. Let $x, y \in \mathbb{R}$. Prove thave if $x^2 - 4x = y^2 - 4y$ and $x \neq y$ then $x + y = 4$.
6. Let A and B be sets. Prove that $A \cap B = A$ iff $A \subseteq B$.
7. Let A and B be sets. Prove that $A \cup B = A \cap B$ iff $A = B$.