Math 441 - Homework 2

- 1. If S and T are sets, prove that $S \setminus T = \emptyset$ if and only if $S \subseteq T$.
- 2. Is the relation $x \equiv_k y$ iff x + y is divisible by k an equivalence relation on \mathbb{Z} ? Prove your answer.
- 3. A relation R on a set S is **circular** iff xRy and yRz implies that zRx, for all $x, y, z \in S$. Prove that a relation is circular and reflexive if and only if it is an equivalence relation.
- 4. Suppose that $f: A \to B$ is a function and $S, T \subseteq A$. Prove or give a counterexample.

(a)
$$S \subseteq T \Rightarrow f(S) \subseteq f(T)$$
.

(b) $f(S) \subseteq f(T) \Rightarrow S \subseteq T$.