Problem Set 4 **Foundations** **Due 9/30/19**

Five of these problems will be graded (our choice, not yours!), with each problem worth 4 points. Clear and complete justification is required for full credit. You are welcome to discuss these problems with anyone and everyone, but must write up your own final submission without reference to any sources other than the textbook and instructor.

1. For any sets A, B, and C, $(B - A) \subseteq (C - A) \cup (B - C)$.
2. Show that
$$\left(\bigcap_{i \in I} A_i\right)' = \bigcup_{i \in I} A_i'$$
3. Show that
$$A \cup \bigcap_{i \in I} B_i = \bigcap_{i \in I} (A \cup B_i)$$
4. Suppose that $a, b, c, d \in \mathbb{R}$, with $a < b$ and $c < d$. Then $a - d < b - c$.
5. Suppose that $a, b, c, d \in \mathbb{R}$, with $a < b$, $c < d$, and $a, c > 0$. Then $a \cdot c < b \cdot d$.
6. Suppose that $a, b \in \mathbb{R}$. If $a < b$ then $a^2 < b^2$.
7. Suppose that $a, b \in \mathbb{R}$. If $a^2 < b^2$ then $a < b$.
8. Suppose that $a, b \in \mathbb{R}$, with $a < b$ and $a, b > 0$. Then $\forall n \in \mathbb{N}, a^n \leq b^n$.
9. For all $x, y, z \in \mathbb{R}$, $|x + y + z| \leq |x| + |y| + |z|$.
10. For all $x, y \in \mathbb{R}$, $d(x, y) = d(y, x)$.