**MAT 442 Week 5 Homework**
Due Wednesday, 9/29

*Added Wednesday, 9/22:*

**Problem 1:** Let $f : \mathbb{C} \to \mathbb{C}$ be the conjugation function with $f(z) = \overline{z}$. Explain geometrically why $f$ is differentiable nowhere. (*Hint*: Think about orientations.)

*Added Friday, 9/24:*

**Problem 2:** Suppose that $f : U \to \mathbb{C}$ is a function where $U$ is an open disk (i.e., $U = N(w, \varepsilon)$ for some $w \in \mathbb{C}$ and $\varepsilon > 0$). Prove that if $f$ is holomorphic on $U$ and real-valued (i.e., $f(z) \in \mathbb{R}$ for all $z \in U$), then $f$ is constant.

**Problem 3:** Suppose that $f : \mathbb{C} \to \mathbb{C}$ is a function. Prove that if both $f$ and $\overline{f}$ are entire, then $f$ is constant.