Math 429, Extra Credit Problems

These problems are hard and interesting. The solutions should be presents orally before April 14. It might improve your score, but should be used for fun. Only the first solution will be graded.

1. Construct a topology $\mathcal{T}$ on $\mathbb{R}$ such that a function $f\colon \mathbb{R} \to \mathbb{R}$ is nondecreasing if and only if it is continuous for the topology $\mathcal{T}$.

2. Find three disjoint open sets in the real line which have the same nonempty boundary.

3. How many pairwise distinct sets can one obtain from of a single set by using the operators closure and interior?