Problem Set 8 **Set Theory & Topology** **Due 4/20/20**

You are expected to do the following problems to a high standard (i.e., at least well enough to be published in a textbook) for full credit. Five of these problems will be selected (by Jon) for grading, with each worth 4 points.

1. [Baker Th. 8.1.9] Let (X, d) be a metric space and let $U \subseteq X$. Then U is open with respect to the metric topology iff for each $x \in U$, there exists $r > 0$ such that $B_r(x) \subseteq U$.
2. [Baker 8.2.5] Complete the proof of Theorem 8.2.5.
3. [Baker 8.2.5] Let (X, d) and (Y, e) be metric spaces. Prove that a function $f : X \to Y$ is continuous iff, for each $x \in X$ and each $\varepsilon > 0$, there exists a $\delta > 0$ such that $f(B^d_\delta(x) \subseteq B^e_\varepsilon(f(x))$.
4. [Baker 8.2.6] Complete the proof of Theorem 8.2.13.
5. [Baker Th. 8.3.12] Let X be a topological space with $A \subseteq X$ and $x \in X$. If there is a sequence in $A - \{x\}$ which converges to x, then x is a limit point of A.