Problem Set 9   **Set Theory & Topology**   **Due 4/27/20**

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. Four of these problems will be selected (by Jon) for grading, with each worth 5 points.

1. [Croom 9.2.1] Prove that equivalence of loops is an equivalence relation.

2. [Croom 9.2.2] Prove Lemma B: The identity element for $\Pi_1(X, x_0)$ is the homotopy class $[c]$ determined by the constant loop c.

3. [Croom 9.2.3] Prove that equivalence of loops is preserved by the $*$ product: If $\alpha \sim \alpha'$ and $\beta \sim \beta'$, then $\alpha * \beta \sim \alpha' * \beta'$.

4. [Croom 9.2.6] Give an example of a simply connected space that is not contractible.