MATH 213, SPRING 2009
HOMEWORK 1

1. Show that every metric space is Hausdorff.
2. Show that if X is a Hausdorff topological space and $K \subset X$ is compact, then K is closed.
3. Suppose that $f : X \to Y$ is a continuous bijection, X is compact and Y is Hausdorff. Show that f is a homeomorphism.
4. Let D be the unit disk in $\mathbb{R}^2$ and let M the space obtained by identifying the diametrically opposite points on the boundary of D (i.e., for each p on the boundary of D, identify p and $-p$). Sketch a proof that M is homeomorphic to the projective plane $P^2(\mathbb{R})$.