Math 431/531 (Topology), Fall 2015
HW 5

Starred problems are for 531 students, and are extra credit for 431 students. 531 students must LaTeX their solutions.

1. Exercise 12.10abc(df*)j from K
2. Exercise 8bcd from Munkres p158. Find counterexamples or give a proof.
3. (*) Exercise 9 from Munkres p158.
4. (For undergrads) Show that $\mathbb{R}^2 \setminus \mathbb{Q}^2$ is path-connected.
5. Let X be the set $[0, 1] \subset \mathbb{R}$ equipped with the standard metric topology. Let Y be the set $[0, 1] \subset \mathbb{R}$ equipped with the cofinite topology.
   (a) Is the identity map of $[0, 1]$ a continuous map from X to Y? Is it a continuous map from Y to X?
   (b) Is Y path-connected?
6. (a) Find a subset of $\mathbb{R}^2$ (containing more than one point) which is path-connected but is only locally connected at a single point. (Hint: Try some lines through the origin.)
   (b) (*) Find a subset of $\mathbb{R}^2$ (containing more than one point) which is path-connected but is not locally connected at any point.
7. (**Extra credit**) Exercise 10 from Munkres p163. (EVERYONE should be aware that the connectedness equivalence relation $\sim$ is (surprisingly!) not the same as the quasi-connected equivalence relation defined in this exercise!! More false intuition...)