Homework for 651

Due Tuesday, February 5, 2007

1. Let $f : X \to Y$ be a map, and M_f its mapping cylinder. Show that f is a homotopy equivalence if X is a (strong) deformation retract of M_f.

2. Find four disjoint circles embedded (disjointly) in $\mathbb{R}^3$ or $\mathbb{S}^3$, such that they are all linked in the sense that there is no two-dimensional sphere that separates them, but they are all separated if any one is removed. This is an extension of the discussion in Hatcher.

3. Problem 5 on page 38 in Hatcher.

4. Problem 9 on page 38 in Hatcher.

5. Suppose that $f : \mathbb{S}^1 \to \mathbb{S}^1$ is a map of the circle to itself such that $f^{-1}(\{1\}) = \{1\}$. What are the possible degrees for f?