Math 8061 Homework 4

Due Thursday, 10/14/10

1. Let C be a circle smoothly embedded in $\mathbb{R}^4$. Prove that there exists a 3–dimensional hyperplane H, such that the orthogonal projection $\pi : C \to H$ is an embedding. *Hint:* use Sard's theorem.

2. Do problem 3-2 on page 78–79 of Lee.

3. Do problem 3-6 on page 79 of Lee.

4. Construct three smooth vector fields on S^3 that are linearly independent at each point. (*Hint:* think of S^3 as the set of unit quaternions in $\mathbb{R}^4$.) Conclude that $TS^3 \cong S^3 \times \mathbb{R}^3$.

5. For any smooth manifold M, prove that the tangent bundle TM is orientable.