MAT 566: Differential Topology
Fall 2006

Problem Set 1
Due on Tuesday, 9/26, by 5pm in Math 3-117

Pick any *two* of the following problems, including a problem other than 1-C and 3-F:

1-C, 3-F, Problem (i), 4-B, 4-C, 4-D.

You should also take a look at the other problems in Sections 1-4 and in Appendix A.

Problem (i): Let R be a ring. Determine $H^*(\mathbb{R}P^n; R)$ as a graded vector space. In the case $R=\mathbb{Z}_2$, use Poincare Duality and induction to determine the ring structure.

Remark 1: If you are interested in algebraic geometry, you should consider doing 1-C or 3-F, as these provide motivation for introducing schemes. The latter problem is longer and harder and requires use of some commutative algebra; you may want to consult the referenced paper, which is available on *jstor*. In addition, you may want to consider attending *Algebra III*, as commutative algebra is necessary for doing algebraic geometry rigorously.

Remark 2: In case you are interested in algebraic topology, there is another topology course this semester, 540, which will continue as 541 in the spring. It will be more advanced, with very little overlap (if any), but likely some interplay, with 566.