Math 3593H Honors Mathematics II Spring Semester 2011

Assignment 8 - Due Thursday 3/24/2011

The second mid-term exam will be held on this date, on the topics of Sections 3.5, 3.6, 3.7, 4.1, 4.3, 4.5 and 4.8

Read: Hubbard and Hubbard Sections 4.9 and 4.10.

Exercises:
Section 4.9 (pages 484 - 485): 1, 3*, 4, 5, 6*.
Section 4.10 (pages 495 - 497): 1, 2, 4, 5*, 7, 8*, 9, 11, 12*, 13, 14, 17, 18, 19*.

Comments:
Perhaps the most important single technique you will have learned in evaluating integrals of a single variable is to make a substitution. The extension of this result to several variables is correspondingly important, not just because it provides a way to evaluate some integrals (e.g. change to polar coordinates), but because it underlies the definition of an integral over a manifold. Section 4.10 is about change of variables, and we will need it starting in Section 5, in Proposition 5.3.2.

Assignment 9 - Due Thursday 3/31/2011

Read: Hubbard and Hubbard Sections 5.1 and 5.3.

Exercises:
Section 5.1 (page 524): 1, 2*, 3*.
Section 5.3 (pages 541-544): 1*, 2, 3, 4, 5, 6*, 7, 8*, 9a, 10, 11, 15, 16*, 18, 20*.

Comments
We are going to leave out Section 5.2. I find it to be rather inconclusive, fussy, complicated and hard to understand. They are dealing with the problem that the notion of parametrization, as introduced previously, is too restrictive. In that previous sense, most manifolds do not have a parametrization. The reason they are troubled by this is that the volume of a manifold depends on the way it sits inside its ambient space, and we have to get at it by means of parametrizations. In fact it is not necessary to deal with this matter in the way they suggest in Section 5.2. In the graduate course 'Manifolds and Topology' a different approach is adopted, but this is too much for us to take on board here. I think it is sufficient for us to deal with manifolds which, apart from a set of volume zero (measured in the dimension of the manifold), are made up of a finite number of pieces, each of which has a parametrization. To do an integral over the manifold, we do an integral on each piece, and add up the answers.