

## Math 3593H

## Honors Mathematics II Spring Semester 2011

The final exam is on Monday May 9, 1:30-4:30pm in **Vincent Hall 6**. You can see complete information about the common math final exams by going to <http://www.math.umn.edu/undergrad/>

**Assignment 14** - Do **not** hand this in to be graded, even though some questions are starred. These questions are just to show you what I would suggest.

**Read:** Hubbard and Hubbard Sections 6.10 and 6.12.

### Exercises:

Section 6.10: 1\*, 2, 4, 5\*, 6\*, 7, 8, 9, 10, 11, 12(use the hint), 13, 14.

For question 1, locate from somewhere a formula for the volume of a torus.

The way I see to do question 3 it is a standard result to do with centers of mass, which we have not done; thus I omit this question.

Section 6.12: We have already done questions like 1 and 2, and I am going to steer clear of things like questions 3 and 7 which go into physics. The only useful questions from this section are 1, 2, 4.

Extra Question\*: Let  $B$  be the half of the unit ball  $x^2 + y^2 + z^2 \leq 1$  in 3-dimensional space specified by  $z \geq 0$ . Let  $S$  be the surface which is the boundary of  $B$ , so  $S$  is the union of a unit disc  $D$  in the  $xy$ -plane and the upper half  $T$  of the surface of a sphere. Let  $S$ ,  $T$  and  $D$  be oriented by the normal pointing outward from  $B$ . By calculating integrals over  $D$  and  $B$ , compute the flux of  $F$  through  $T$ , where  $F$  is the vector field

$$F \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} x + \cos y + \cos z \\ y + \sqrt{x^2 + 1} \ln(z^2 + 1) \\ z + 3 \end{pmatrix}$$

**Comments:** If there remains sufficient time I will discuss Newton's theorem about the gravitational field around a spherically symmetric body (not in the book). There will also be a review sheet for the final exam forthcoming.

This has been a great year and it has been a real pleasure and a privilege to teach you!