**Math 3592H** **Honors Mathematics I Fall Semester 2005**

Change to Assignment 5: question 7 from section 1.6 is postponed to this week.

**Assignment 6** - Due Thursday 10/20/2005

**Read:** Hubbard and Hubbard Section 1.7. My guess is that we will probably only get up to page 138 or so this week, but let's see!

**Exercises:**
Hand in only the exercises which have stars by them.

Section 1.6 (pages 124-125): 7*
Section 1.7 (pages 142-145): 1d*, 2*, 4b*, 5c*, 7a*, 10*,

Extra Questions
1. For each of the following functions find the directional derivative in the direction of the unit vector **u** at the point **x.**

(a) $f(x,y,z) = x^2 + y^2 + z^2,\ \ u = (\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}}),\ \ x = (1,0,1),$

(b) $f(x,y) = x^2 - y^2,\ \ u = (\frac{1}{\sqrt{2}},\frac{1}{\sqrt{2}}),\ \ x = (2,1),$

(c) $f(x,y) = x + y,\ \ u = (1,0),\ \ x = (2,3),$

(d*) $f(x,y,z) = xy\sin z,\ \ u = (\frac{1}{\sqrt{2}},0,\frac{-1}{\sqrt{2}}),\ \ x = (1,1,1),$

2. Show that the function f defined by

$$f(x,y) = \begin{cases} \dfrac{x\,|\,y\,|}{\sqrt{x^2+y^2}}, & (x,y) \neq (0,0) \\ 0, & (x,y) = (0,0) \end{cases}$$

has a directional derivative in every direction at (0,0), but that f is not differentiable at (0,0). [Hint: If f were differentiable at (0,0) then we would have f'(0,0)=0.]

**Comments!:**
We have been covering some really difficult stuff, most of which you are seeing in a more sophisticated form than other classes get to see, and which is capable of a still more sophisticated treatment. It is not easy to strike the right balance. I firmly believe myself that it is appropriate for us to be going through things in this way, not proving everything and sometimes not doing much more than getting the idea.

For me, the trouble is to lead you through the material at a suitable pace, and I have been going more slowly than I planned when setting the homework. It means that most weeks I am cancelling some HW problems, and leaving you to do a couple of problems the night before HW is due, based on material covered the previous day. This is a bad habit that I have got into, and I apologize.