Math 3593H **Honors Mathematics II Spring Semester 2013**

Assignment 5 - Due Thursday 2/28/2013

Read: Hubbard and Hubbard Sections 3.7. We may also start on Section 4.1, but I set no homework questions on this section.

Exercises:
Section 3.7 (pages 368-371): 1, 2, 3*, 4*, 5, 6, 7, 8*, 9, 10a*, 10b*, 11, 13, 14.
Hint for 10: let v be an eigenvector and see what you can say about $v^T A^T Av$.

Extra question: A* Let $f(x,y) = x^2 + e^y - y$ be defined only on the unit disc $x^2 + y^2 \le 1$. Show that on the unit disc this function takes its maximum value on the boundary. Calculate the maximum value and a point at which it takes it.
Hint: The equation $e^y - 2y - 1 = 0$ has two roots, the larger of which is greater than 1. At the end of this question use a calculator.

Comments:
Section 3.7 is about Lagrange multipliers, which I regard as quite a neat idea, but not that helpful in practice because the calculations you can get into can be very bad. This makes it hard to set complicated questions about Lagrange multipliers on exams, because it would not be possible to do them in limited time. Maybe that is not such a bad thing? If we are only doing the simpler kind of question, then it might make sense to look at a simpler treatment than the one given in Hubbard and Hubbard, which is rather lengthy, and not the main thing this course is about. As it is, you are seeing Lagrange multipliers where there may be more than one multiplier, and this is possibly the only course in this university where this is done.

At the end of Section 3.7 they prove the 'spectral theorem' using Lagrange multipliers, which is not the standard proof. I personally prefer the standard proof, but still this one is not so bad, so we will study it.

I am not quite sure what to do about Section 3.8, which is about curvature. They get into some quite complicated formulas for computing curvature, and I do not think it helps one's understanding of curvature particularly to be fluent with this formulas. I would prefer a more rudimentary presentation with just the key facts. As it is, I think we should skip this section. This is a pity since not that long ago it was determined with some accuracy that the universe we live in is flat, and not curved. It is nice to have some conception of what this means.