INC 691 Linear and Nonlinear System Identification　　　　　**Homework 6**
Assign: Fri 11 May 2012　　　　　　　　　　　**Due: Fri 18 May 2012**

Instruction: Hand in your work in the mail box labeled INC691 by 4 pm. or submit it via email. DO NOT copy homework from your classmates or lend it to others. Anyone who violates this regulation will be given zero for the homework.

1. Show that the eigenvalues of the Hessian of a quadratic function are equal to the second derivatives of that function in the direction of the corresponding Hessian eigenvectors.

2. Let $V : \mathbb{R}^2 \to \mathbb{R}$, $V(x) = x_1^2 - 2x_1 + 3x_1 x_2^2 + 4x_2^3$, $x_0 = \begin{bmatrix} 1 & 1 \end{bmatrix}^T$, $f = \begin{bmatrix} -2, 1 \end{bmatrix}^T$. Find the first and second order of the directional derivative of $V(x)$ along f.