Fall 2010 Polynomials Homework-Assignment 6 **Name:** _____

Write-up your solution carefully including all the details of the proof. Due December 2. Please staple your assignment.

(1) (5 points)

Write $f = x_1^2x_2+x_2^2x_1+x_3^2x_1+x_1^2x_3+x_2^2x_3+x_3^2x_2$ as polynomial in the fundamental symmetric polynomials.

(2) (5 points) Solve

$$x^4 - 2x^2 + 8x - 3 = 0$$

using Descartes method.

(3) (5 points) Solve

$$x^3 - 3x - 2 = 0$$

using Viete's method.

(4) (5 points)

Suppose that $f(x)$ is a real polynomial over $\mathbf{R}$ with discriminant D. If f has only real roots prove that $D \geq 0$.

Show that converse holds for polynomials of degree $2, 3$ but not for higher degree polynomials.

(5) (5 points)(graduate students)

Show that the sign of the discriminant of a real polynomial with distinct roots equals $(-1)^k$ where k is the number of pairs of nonreal complex conjugate solutions.