**MATH 477/577. DUE NOV. 4** **NAME**: _____

**HOMEWORK/COMPUTER ASSIGNMENT** **ID**: _____

**HOMEWORK SET # 4**

**DATE**: _____

Please read lectures 14 ~ 19 in your textbook and review your lecture notes. Graduate students do problems with a star ONLY; undergraduate students do problems without a star ONLY. When submit your work, please use this problem sheet as your cover page.

**Question 1.**

Fundamental concepts on conditioning and stability.

(a): Polynomial root-finding problem is a classical ill-conditioned problem. Consider Wilkinson's polynomial, $\omega(x) = \prod_{i=1}^{20}(x-i) = (x-1)(x-2)\cdots(x-20) = a_0 + a_1 x + \cdots + a_{19}x^{19} + x^{20}$. The 14th root is 14. Using the definition of the condition number, calculate the condition number of this problem if we slightly perturb $a_{14} \approx 4.02 \times 10^{10}$.

(b): Problem 14.1 and 14.2.

(c*): same as part (a)

(d*): Problem 14.1 and 14.2.

(e*): Problem 15.1.

**Question 2.**

Fundamental concepts on the stability of QR and back substitution

(a): Problem 17.2

(b): Problem 18.1 and 18.4

(c): Problem 19.1.

(d*): Problem 17.2.

(e*): Problem 18.1 and 18.4

(f*): Problem 19.1.

## Computer Assignment #4 for ALL students:

(1): Do problem 12.3.

(2): Read lecture 19 carefully and repeat the example using m=50 and n=10.