AMCS 602

Problem set 4 due September 27, 2016

Dr. Epstein

Reading: Page numbers below refer to *Numerical Linear Algebra* by Trefethen and Bau.

Standard problems: The following problems should be done, but do not have to be handed in.

1. Pge 76, problem 10.1.
2. Page 85, problem 11.2.
3. Page 85, problem 11.3.
4. Page 96, problem 12.1.

Homework assignment: The solutions to the following problems should be carefully written up and handed in.

1. Page 76, problem 10.2.
2. Page 76, problem 10.4.
3. Page 85, problem 11.1.
4. Page 96, problem 12.2. In this problem, "the data at $\{x_j\}$" is a vector $\boldsymbol{b} = (b_1, \ldots, b_n)$ so that p is defined by $p(x_j) = b_j$. The first part of the problem asks for the matrix $A(x; y)$ so that $[A(x; y) \cdot \boldsymbol{b}]_j = p(y_j)$ for $j = 1, \ldots, m$.
5. Page 96, problem 12.3. This a problem about using numerical simulations to deduce hypotheses and provide evidence for them. You are not being asked to prove anything.
6. Let $x_\pm$ be the roots of the equation $x^2 + bx + c = 0$ given by the quadratic formula:
$$x_\pm = \frac{-b \pm \sqrt{b^2 - 4c}}{2}. \tag{1}$$
Determine the conditioning (both absolute and relative) of x_+ as b varies with c held fixed, and as c varies with b held fixed. Note that there are a variety of cases to consider. Finally, explain formula (12.7) in the book and relate it to your analysis.