CS 5114
Homework Exercise 7

Given: April 6, 2000 **Due:** April 14, 2000

The point value of each problem is shown in [ ]. Each solution must include all calculations and an explanation of why the given solution is correct. In particular, write complete sentences. A correct answer without an explanation is worth no credit. The assignment must be *submitted* to the instructor by 12:00 noon on April 14, 2000. See syllabus for late policy.

Electronic preparation of your solutions in LaTeX is mandatory. Here is the suggested procedure.

> Retrieve this LaTeX source file `homework7.tex` from the 5114 Web pages and rename it `solvehw7.tex`. Delete these instructions. Enter your solutions in the locations explained by LaTeX comments (`%`). Also enter your name in the `\student` command and uncomment the line near the beginning of the file that uses the `\student` command. When you are satisfied with your solutions, print a copy and turn it in during class or no later than noon on April 14, 2000.

Electronic submission is optional. If you use electronic submission, send an email to `cs5114@courses.cs.vt.edu` with subject `Solutions to Homework Assignment 7` and with two attachments: `solvehw7.tex` and `solvehw7.ps`. Your email must be *received* by 12:00 noon on April 14, 2000.

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[10] 1. CLR Exercise 31.2-4.

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[20] 2. Start with this matrix of integers:

$$A = \begin{pmatrix} 0 & 0 & 130 & 2 \\ 20 & 0 & 26 & 18 \\ 40 & 0 & -13 & 4 \\ 140 & -8 & 21 & 0 \end{pmatrix}.$$

A. Use the algorithm in the book to find an LUP decomposition of A. **Show all intermediate steps and the final values of L, U, and P explicitly.**

B. Use the algorithms in the book and your LUP decomposition of A to find all solutions to the equation

$$Ax = b,$$

where $x = (x_1\ x_2\ x_3\ x_4)^T$ is a vector of unknowns and $b = (0\ -2\ 5\ 1)^T$ is a known vector. **Show your work in detail.**

[10] 3. CLR Exercise 33.2-2. **Show your work in detail.**

[10] 4. CLR Exercise 33.5-2. **Show all your reasoning and work in detail.**