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 \texttt{\texttt{\texttt{\texttt{\texttt{student}}}}} command and uncomment the line near the beginning of the file that uses the \texttt{\texttt{\texttt{\texttt{\texttt{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.

\textbf{[10]} 1. CLR Exercise 31.2-4.

\textbf{[20]} 2. Start with this matrix of integers:

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

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