Math 242: Linear Algebra Fall 2008
Homeworks before the first exam
All problems are from the text unless otherwise noted.

**Homework 1**: Due Monday 9-1-08

Turn in:
Section 1.1 # 2
Section 1.2 # 11b, 22, 24, 30, 37abe

Do (but do not turn in):
Section 1.2 # 1,2,4e,8,11a

Comments: For 1.2.11b provide a proof
For 1.2.30 use $\sum$ notation.

**Homework 2**: Due Monday 9-8-08

Turn in:
Section 1.3 # 1f, 4, 13, 20bd, 21
Section 1.4 # 13b, 15c, 19f

Do (but do not turn in):
Section 1.3 # 1c, 14ace, 21, 22ce, 27, 31ce
Section 1.4 # 9,13ac, 15ab, 19ce, 24

Comments: For 1.3.13 use induction to prove that $A_{ij} = 0$ for $i > j-k$ which then proves the result.

**Homework 3**: Due Friday 9-12-08

Turn in:
Section 1.5 # 4,18c,21,24e,31e
Section 1.6 # 12,13a,15

Do (but do not turn in):
Section 1.5 # 1b, 2, 9, 14, 18ab, 24ad
Section 1.6 # 1d, 5, 13b, 14

**Homework 4**: Due Wednesday 9-17-08

Turn in:
Section 1.8 # 4, 9, 10bd, 15, 22d, 23h
Section 1.9 # 1ceg, 6, 8
problem 4.1 below

Do (but do not turn in):
Section 1.8 # 7, 10ac, 13, 22ae
Section 1.9 # 1bf

Comments: The answer to 1.8.4 is in the back of the book and it is incorrect. Make sure you give an explanation, not just the answer.
For 1.8.15a describe the $LU$ factorization. Write $v^T = (v_1 \ v_2 \ \cdots \ v_m)$ and
\( \mathbf{w}^T = (w_1 \ w_2 \ \cdots \ w_n) \) and assume that \( w_1 \neq 0 \) and \( v_1 \neq 0 \).

hw4.1: Let \( A = LU \) with

\[
A = \begin{bmatrix}
1 & 2 & 0 & 1 & 2 & 1 \\
2 & 4 & 2 & 4 & 4 & 2 \\
2 & 4 & 2 & 4 & 4 & 3 \\
3 & 6 & 4 & 7 & 6 & 7
\end{bmatrix}
L = \begin{bmatrix}
1 & 0 & 0 & 0 \\
2 & 1 & 0 & 0 \\
2 & 1 & 1 & 0 \\
3 & 2 & 4 & 1
\end{bmatrix}
\]

\[
U = \begin{bmatrix}
1 & 2 & 0 & 1 & 2 & 1 \\
0 & 0 & 2 & 2 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 1 \\
0 & 0 & 0 & 0 & 0 & 0
\end{bmatrix}
L^{-1} = \begin{bmatrix}
1 & 0 & 0 & 0 \\
-2 & 1 & 0 & 0 \\
0 & -1 & 1 & 0 \\
1 & 2 & -4 & 1
\end{bmatrix}
\]

For

\[
\mathbf{x} = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \end{pmatrix}, \quad \mathbf{b}' = \begin{pmatrix} 1 \\ 2 \\ 3 \\ 7 \end{pmatrix}, \quad \mathbf{b}'' = \begin{pmatrix} 1 \\ 2 \\ 3 \\ 14 \end{pmatrix}
\]

Consider both \( A\mathbf{x} = \mathbf{b}' \) and \( A\mathbf{x} = \mathbf{b}'' \). For each either solve the system (making use of \( LU \), not Gaussian elimination) or give a certificate (relating to \( A \) and \( \mathbf{b} \) not \( L \) or \( U \)) showing that there is no solution.