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 $\boldsymbol{v}^T = \begin{pmatrix} v_1 & v_2 & \cdots & v_m \end{pmatrix}$ and

$\boldsymbol{w}^T = \begin{pmatrix} w_1 & w_2 & \cdots & w_n \end{pmatrix}$ and assume that $w_1 \neq 0$ and $v_1 \neq 0$.

hw4.1: Let $A = LU$ with

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

$$U = \begin{bmatrix} 1 & 2 & 0 & 1 & 2 & 1 \\ 0 & 0 & 2 & 2 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \quad L^{-1} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ -2 & 1 & 0 & 0 \\ 0 & -1 & 1 & 0 \\ 1 & 2 & -4 & 1 \end{bmatrix}.$$

For

$$\boldsymbol{x} = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \end{pmatrix} \qquad \boldsymbol{b'} = \begin{pmatrix} 1 \\ 2 \\ 3 \\ 7 \end{pmatrix} \qquad \boldsymbol{b''} = \begin{pmatrix} 1 \\ 2 \\ 3 \\ 14 \end{pmatrix}.$$

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