ENEE 241/MATH 242 Dr. Wolfe ASSIGNMENT #2 Due February 17/18, 2004

Readings: *Linz & Wang* , Section 3.1, Section 8.1 through the first paragraph on p.213.

1. MATLAB
   (a) Let $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$. Compute both $A.\hat{}\ 2$ and $A\hat{}\ 2$ and explain the difference between the two results.
   (b) Let $\mathbf{a} = [\ 1\ 2\ 3\ 4\ ]$. Compute both $\mathbf{a} * \mathbf{a}'$ and $\mathbf{a}' * \mathbf{a}$ and explain the difference between the two results.
2. MATLAB . Let $\mathbf{w} = \text{rand}(2, 1),\ \mathbf{z} = \mathbf{w}/\text{sum}(\mathbf{w})$. Let

$$P = \begin{pmatrix} .2 & .4 \\ .8 & .6 \end{pmatrix}$$

   Compute $P^n\mathbf{z}$ for $n = 1, \ldots 20$. What do you notice ?
3. Solve the following systems by Gauss Elimination (by hand).
   (a)

$$\begin{aligned} -x_1 + 2x_2 + x_3 &= 5 \\ x_1 + 4x_2 - 3x_3 &= -8 \\ -2x_1 \qquad + x_3 &= 5 \end{aligned}$$

   (b)

$$\begin{aligned} x_1 - x_2 + x_3 &= 0 \\ 2x_1 + x_2 - x_3 &= -3 \\ x_1 + 2x_2 - 2x_3 &= -2 \end{aligned}$$

4. Problem 8, p.38 *Linz & Wang* . (Use MATLAB .)
5. Problem 11, p.39 *Linz & Wang* . (Use MATLAB .)
6. Problem 2, p.215 *Linz & Wang* . Use the LU decomposition of A to solve $A\mathbf{x} = \mathbf{b}$ where $\mathbf{b} = (-4, -5, 19)^T$.
7.
   (a) Let A be an $n \times n$ matrix and $\mathbf{x} \in \mathbf{R}^n$. How many *flops* does it take to form the product $A\mathbf{x}$?
   (b) Let A and B be $n \times n$ matrices. How many *flops* does it take to form the product AB ?
   (c) In light of the results of (a) and (b), from the standpoint of efficiency, how should one compute $A^k\mathbf{x}$ for k a positive integer $k > 1$?