APMA 308 MIDTERM #1 FEBRUARY 26TH, 2008

NAME: _____ SECTION: _____

PLEDGE: _____

_____

SIGNATURE: _____

To get credit for a problem, you must show all of your reasoning and calculations. No calculators may be used.

Problem	**Score**
1	
2	
3	
4	
5	
Total	

1. (20 pts) Solve the following homogeneous system of linear equations and find a basis for and the dimension of the subspace of the solutions.

$$\begin{aligned} x_1 + x_2 - 2x_3 + 3x_4 &= 0 \\ 2x_1 + x_2 - 5x_3 + 2x_4 &= 0 \\ 3x_1 + x_2 - 8x_3 + x_4 &= 0 \end{aligned}$$

2. (20*pts*) Solve the system of linear equations by determining the inverse of the matrix of coefficients and then using matrix multiplication.

$$\begin{aligned} x_1 + 2x_2 + x_3 &= 1 \\ 3x_1 + 5x_2 - 3x_3 &= 0 \\ 2x_1 + 3x_2 - 3x_3 &= 2 \end{aligned}$$

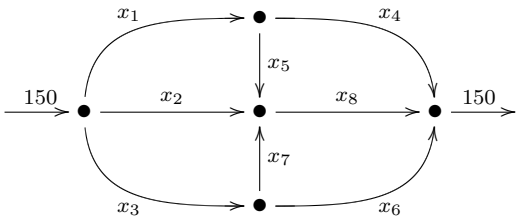
3. (20pts) Solve the following system of linear equations using the method of LU decomposition.

$$\begin{aligned} 2x_1 - x_2 + x_3 &= 4 \\ 4x_1 - x_2 + 4x_3 &= 0 \\ 2x_1 + x_3 &= 2 \end{aligned}$$

4. (a) (12pts) Find a basis for the subspace of all vectors orthogonal to both $(1, 2, 1, 2)$ and $(2, 5, 3, 1)$.

   (b) (8pts) Check whether the vectors $(1, 1, 1)$, $(1, 1, -1)$, and $(-1, 1, 1)$ are linearly independent or not

5. (a) (6pts) Construct a system of linear equations that describes the traffic flow in the road network of the following figure. (need not solve).



(b) (6pts) Check whether $T : \mathbb{R}^2 \longrightarrow \mathbb{R}^2, T(x, y) = (x + y, xy)$ is a linear transformation or not.

(c) (8pts) Show that $W = \{(a, b, c) | a + b + c = 0; a, b, c \in \mathbb{R}\}$ is a subspace.