Linear Algebra
Quiz 3

Name:______________________________

You have 10 minutes to complete this quiz. If you have a question raise your hand and remain seated. In order to receive full credit your answer must be **complete**, **legible** and **correct**. Show your work, and give adequate explanations.

1. Find weights w_1, w_2 and w_3 (if they exist) such that
$$\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} = w_1 \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix} + w_2 \begin{bmatrix} 2 \\ 0 \\ 2 \end{bmatrix} + w_3 \begin{bmatrix} 3 \\ 3 \\ 0 \end{bmatrix}.$$

The weights must satisfy $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 & 2 & 3 \\ 1 & 0 & 3 \\ 1 & 2 & 0 \end{bmatrix} \begin{bmatrix} w_1 \\ w_2 \\ w_3 \end{bmatrix}$. Solving, we get $\begin{bmatrix} w_1 \\ w_2 \\ w_3 \end{bmatrix} = \begin{bmatrix} \frac{1}{2} \\ \frac{1}{4} \\ \frac{1}{6} \end{bmatrix}$.

2. Find the nullspace of $\begin{bmatrix} 0 & 2 & 3 \\ 1 & 0 & 3 \\ 1 & 2 & 0 \end{bmatrix}$.

Recall that the nullspace of A is the space of all $\mathbf{x}$ such that $A\mathbf{x} = \mathbf{0}$.

The fact that there was a unique solution to Problem 1 implies that there there is a unique solution to the homogeneous system $A\mathbf{x} = \mathbf{0}$, which must be $\mathbf{x} = \mathbf{0}$. Hence the nullspace of A is $\{\mathbf{0}\}$.