Math 251 X02
Test Two

Time: 50 minutes
Total: 16 marks

Name: _____

1. [3 marks]

Write $\mathbf{w} = \begin{bmatrix} 13 \\ 76 \\ 74 \end{bmatrix}$ as a linear combination of $\mathbf{u} = \begin{bmatrix} 1 \\ 5 \\ 4 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 2 \\ 11 \\ 10 \end{bmatrix}$, or show that it is impossible to do so.

2. [3 marks] Write down the system of equations you would use to solve the following problem. **Do not solve the system**.

Balance $C_{57}H_{110}O_6 + O_2 \rightarrow CO_2 + H_2O$

3. [4 marks] Compute $B^2 - AC^T$ where:

$A = \begin{bmatrix} 1 & -1 \\ 3 & 6 \end{bmatrix}, B = \begin{bmatrix} 8 & 7 \\ 2 & -2 \end{bmatrix}$ and $C = \begin{bmatrix} 5 & -3 \\ 9 & 2 \end{bmatrix}$

4. [3 marks] Write $A = \begin{bmatrix} 1 & 3 \\ 0 & 2 \end{bmatrix}$ as a product of elementary matrices.

5. [3 marks] Find a 2×2 matrix A such that:

a) $A^2 = I$ but $A \neq I$

b) $A \begin{bmatrix} 1 & 2 \\ 2 & 5 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$