Math 251 X01
Test Two

Time: 50 minutes
Total: 16 marks

Name: _____

1. [3 marks]

Write $\mathbf{w} = \begin{bmatrix} 29 \\ 163 \\ 188 \end{bmatrix}$ as a linear combination of $\mathbf{u} = \begin{bmatrix} 1 \\ 5 \\ 4 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 2 \\ 11 \\ 12 \end{bmatrix}$, 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 $C_8H_{18} + O_2 \rightarrow CO_2 + H_2O$

3. [4 marks] Compute $C^2 - AB^T$ 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 $A = \begin{bmatrix} 4 & 8 \\ 0 & 1 \end{bmatrix}$ as a product of elementary matrices.

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

a) $A^2 = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ but $A \neq \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

b) $A \begin{bmatrix} 1 & 2 \\ 3 & 7 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$