1. Write your answers clearly. To get complete credit, adequate work must be shown to support your answers.

2. The numbers on the right indicate the maximum credit for the corresponding question.

3. Use of calculators is NOT permitted.

1. (a) Let \( A = \begin{bmatrix} 3 & -2 & 7 \\ 6 & 5 & 4 \\ 0 & 4 & 9 \end{bmatrix} \) and \( B = \begin{bmatrix} 6 & -2 & 4 \\ 0 & 1 & 3 \\ 7 & 7 & 5 \end{bmatrix} \). Find the third row vector of \( AB \) and second column vector of \( BA \). [6]

(b) Using the same matrices as in Q.1(a), find \( \text{tr}(AB) - (\text{tr} A)(\text{tr} B) \). [4]

2. (a) Find a system of linear equations whose consistancy or inconsistancy determines whether the vector \( v = (5, 6, 5, 5) \) is a linear combination of \( u_1 = (3, 0, -1, 2), u_2 = (1, 1, 1, 1), u_3 = (2, 3, 0, 2), u_4 = (-1, 2, 5, 0) \). [3]

(b) Find a solution of the linear system obtained in Q.2(a) and express \( v \) as a linear combination of \( u_1, u_2, u_3, u_4 \). [7]

3. (a) Suppose that the augmented matrix for a system of linear equations has been reduced by row operations to the given reduced row echelon form. Solve the system. Assume that the variables are named \( x_1, x_2, \ldots \), from left to right.

\[
\begin{bmatrix}
1 & -3 & 0 & 0 \\
0 & 0 & 1 & 0 \\
0 & 0 & 0 & 0 \\
\end{bmatrix}
\] [7]

(b) Express the solution obtained in Q.3(a) as a linear combination of column vectors. [3]

4. Solve the linear system by Gauss-Jordan elimination:

\[
\begin{align*}
x_1 + x_2 + 2x_3 &= 8 \\
-3x_1 - 2x_2 + 3x_3 &= 1 \\
3x_1 - 7x_2 + 4x_3 &= 10
\end{align*}
\] [10]

5. Find a quadratic polynomial whose graph passes through the points \((1, 1), (2, 2)\) and \((3, 5)\). [10]