1. (3 points)

(1). Input vectors \( u = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} \) and \( v = \begin{bmatrix} 2 \\ 3 \\ 4 \end{bmatrix} \), then calculate the vector \( w = 3 \cdot u + 2 \cdot v \).

(2). Calculate the vector \( w = 5 \cdot u - 7 \cdot v \).

(3). Use the MATLAB ‘==’ command to confirm that addition of \( u \) and \( v \) is commutative (remember, it is for all vectors!).

(4). Calculate the lengths of vectors \( u \) and \( v \).

(5). Calculate the inner product of \( u \) and \( v \).

(6). Calculate the angle between vectors \( u \) and \( v \). You only need to show the value of \( \cos(u, v) \).

2. (5 points)

You are given the system of linear equations below:

\[
\begin{align*}
  x + y + z &= 4 \\
  2x + y &= 3 \\
  y + z &= 3
\end{align*}
\]

(1). Find the associated matrix (denoted as \( A \)) and the right-hand side vector (denoted as \( b \)).

(2). Calculate the rank of \( A \).

(3). Calculate the inverse of \( A \).

(4). Calculate the transpose of \( A \).

(5). Calculate the solution of the system of linear equations.

(6). Input matrix \( B = \begin{bmatrix} 1 & 3 & 5 \\ 7 & 9 & 11 \\ 13 & 15 & 17 \end{bmatrix} \). Then calculate \( C = A + 2 \cdot B \), \( D = A \cdot B \).

(7). If the first equation \( x + y + z = 4 \) is replaced by \( x + y + 0.5z = 4 \), MATLAB cannot find a solution to the new system of equations. Try this for yourself in MATLAB, then use what you have learned to explain why.