**a)** Let , and be vectors in

. Are **u**, **v** and **w** linearly independent? Justify your answer.

In order for the vectors to be linearly independent, the only solution to the equation

has to be for scalars The above equation then can be rewritten as a system of linear equations

By and it is reduced to

where both equations reduce to

Since both equations are the same, there are infinitely many solutions to the system. The scalars can then be expressed as

Thus, the three vectors are linearly dependent, as required.

**b)** Consider the matrices

and

Show that the matrix

belongs to Span(

To prove that B is in the span, B can be expressed as a linear combination of and as

which can be written as a system of linear equations

By we get

By we get

To check for consistency,

Thus, B belongs to Span( as required.

**c)** Let A and B be invertible matrices given by

and

Let be a scalar. Prove that Suppose A and B are both symmetric, how does this result simplify further.

The transposes of both matrices are

The inverses of both matrices are

The LHS can be simplified step-by-step as

The RHS can be simplified step-by-step as

As can be seen, the LHS and RHS are equal; thus, . If A and B are both symmetric, then and . Therefore,

where