**ENGN2020 – HOMEWORK2**

### Problem 3

#### (1) Answer:

Let matrix **A** = , vector b =

**a)**

, which is **A** after changing row 2 and row 3,

, which is b after changing row 2 and row 3.

**b)**

, which is A after the third row subtracting 5 times the first row.

, which is b after the third row subtracting 5 times the first row.

**c)**

, which is A after multiplying the fourth row by 8.

, which is b after multiplying the fourth row by 8.

Let **A** be a 4 X 2 matrix ,

then **B** = = =

=

then **C** = = =

=

Therefore, **B** doesn`t equal to **C**

#### (2) Answer:

Proof: , do the same row operation on both sides, left side still equals to the right side.

**M** is obtained from **A** by an elementary row operation while right side equals to **EA**,

therefore: **M** = **EA**

### Problem 4

#### (1) Chapter7-section4-14:

***If A is not square, either the row vectors or the column vectors of A are linearly dependent.***

***Proof:*** Since **A** is not square, let **A** is a *m* *n* matrix, .

***THEOREM 4:* *Consider p vectors each having n components. If n<p,* then these vectors *are linearly dependent.***

If *m*>*n*, there are *n* column vectors, each vector has *m* components, according to Theorem 4, column vectors are dependent.

If *m*<*n*, there are *m* row vectors, each vector has *n* components, those row vectors are dependent.

Therefore, either the row vectors or the column vectors are linearly dependent.

#### (2) Chapter7-section4-15:

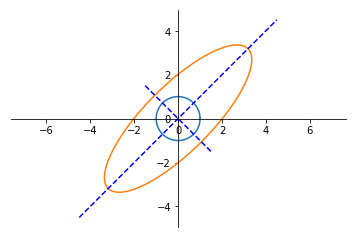
***If the row vectors of a square matrix are linearly independent, so are the column vectors, and conversely.***

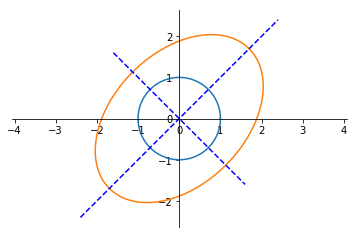
***Proof:*** Let matrix **A** be a square *n n* matrix. If the row vectors are linearly independent, as the definition of the rank of a matrix, rank **A** = *n*.

Assume: column vectors are not linearly independent, then the rank of matrix **A** has to be smaller than *n*, which is controversial with rank **A**= *n*, therefore the column vectors are linearly independent.

### Problem 5

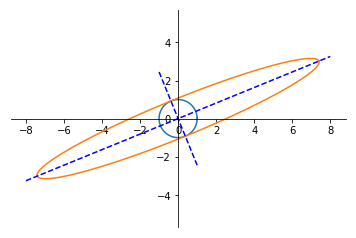
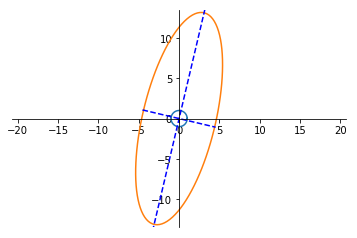
**(1) Chapter8-section2-1: (2) Chapter8-section2-2:**

**A** = **A** =



**(3) Chapter8-section2-3: (4) Chapter8-section2-4:**

**A** = **A** =



**(5) Chapter8-section2-5: (6) Chapter8-section2-6:**

**A** = **A** =

