Linear Algebra Homework 10, Question #1, April 14 2018

Maxwell Greene

Question 1 (a):

Initial matrix B

```
B = [1 -2  0  1  0 -2 3 ;
     2 -4  2  4  6 -8 1 ;
     3 -6  1  4  1 -8 5 ;
     1 -2 -2 -1 -3  2 4]
```

```
B =
     1    -2     0     1     0    -2     3
     2    -4     2     4     6    -8     1
     3    -6     1     4     1    -8     5
     1    -2    -2    -1    -3     2     4
```

Reduced row-echelon form of B

```
rref(B)
```

```
ans =
     1    -2     0     1     0    -2     0
     0     0     1     1     0    -2     0
     0     0     0     0     1     0     0
     0     0     0     0     0     0     1
```

Basis for row space of B

```
rowspace = colspace(sym(B'))';
rowspace(1,:), rowspace(2,:), rowspace(3,:), rowspace(4,:)
```

$$\text{ans} = (1 \quad -2 \quad 0 \quad 1 \quad 0 \quad -2 \quad 0)$$
$$\text{ans} = (0 \quad 0 \quad 1 \quad 1 \quad 0 \quad -2 \quad 0)$$
$$\text{ans} = (0 \quad 0 \quad 0 \quad 0 \quad 1 \quad 0 \quad 0)$$
$$\text{ans} = (0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 1)$$

Basis for column space of B

```
columnspace = colspace(sym(B));
columnspace(:,1)', columnspace(:,2)', columnspace(:,3)', columnspace(:,4)'
```

$$\text{ans} = (1 \quad 0 \quad 0 \quad 0)$$
$$\text{ans} = (0 \quad 1 \quad 0 \quad 0)$$
$$\text{ans} = (0 \quad 0 \quad 1 \quad 0)$$
$$\text{ans} = (0 \quad 0 \quad 0 \quad 1)$$

Rank of B

```
rank(B)
```

```
ans = 4
```

Nullity of B

```
[rows, cols] = size(B);
nullity = cols-rank(B)
```

```
nullity = 3
```

Question 1(b)

Null space of B

```
nullspace = null(B,'r')
```

```
nullspace =
     2    -1     2
     1     0     0
     0    -1     2
     0     1     0
     0     0     0
     0     0     1
     0     0     0
```

```
nullspace(:,1)',nullspace(:,2)',nullspace(:,3)'
```

```
ans =
     2     1     0     0     0     0     0
ans =
    -1     0    -1     1     0     0     0
ans =
     2     0     2     0     0     1     0
```

Check fo null space

```
B*nullspace
```

```
ans =
     0     0     0
     0     0     0
     0     0     0
     0     0     0
```