Homework 3

1. **p.168 Ex.17**

As given in the question, matrix, matrix, thus giving us…

matrix, with rank at most 1

So as an example we let…

, then

Based on our example we can clearly see that the rank of , as has at most one independent row or column.

Converse: matrix, with rank 1

If has rank 1, this means according to theorem 3.5 that the column of is equal to the maximum linear set. Hence, the remaining two columns can be found by multiplying some scalar value (which could be 0).

Therefore, we can assume since ,

then

1. **p.168 Ex.21**

We know that , and by theorem 3.4, then .

, since is onto.

Finally by theorem 3.6, we know that rank , and where , we have , thus .

1. **p.180 Ex.2 (g)**

We can set , giving us…

So we have…

So the basis for the solution space is…

And the dimension is…

1. **p.180 Ex.3 (g)**

Subtracting equation 2 from equation 1, we get…

Giving us…

Then we put equation 2 in terms of (to match equation 1), and we get…

Which then gives us…

, which then gives us our solution set .

Our span is .

1. **p.180 Ex.6**

we set…

We set , giving us….

1. **p.197 Ex.12(a)(b)**
2. Using given equations…

We can make the augmented matrix…

, then changing it to reduced row echolen form, we get

Therefore, because the first and second columns of B (our reduced row echelon form matrix), are , from theorem 3.16, we can conclude that , (the first two columns of matrix A), are a linearly independent subset of V.

1. We first obtain basis for , which gives us…

Which we can then (combine with matrix A above) and use to obtain the augmented matrix…

, which in reduced row echelon form gives us…

the basis for containing are…

1. **p.222 Ex.19**

The matrix has now been converted into an upper triangular matrix, so we can calculate the determinant by getting the product of the diagonal entries…

1. **p.222 Ex.20**

The matrix has now been converted into an upper triangular matrix, so we can calculate the determinant by getting the product of the diagonal entries…

1. **p.228 Ex7**

Using Cramer’s rule, the following equations in the form, , gives us…

We calculate first…

, then

Thus giving us the unique solutions to the given system of equations…

1. **p.237 Ex.4(g)**

let matrix

We first convert the matrix to an upper triangular matrix form…

Then we can multiply the diagonal to calculate the determinant