

160102

## Assignment 1

3)  $x \quad Y$ 

$$\begin{array}{r} -2 \\ -1 \\ 0 \\ 1 \\ 2 \\ \hline 16 \end{array} \quad \begin{array}{r} 47 \\ 8 \\ 1 \\ 2 \\ 11 \\ \hline \end{array}$$

$$Y = ax^4 + bx^3 + cx^2 + dx + e$$

$$47 = ac(-2)^4 + bc(-2)^3 + cc(-2)^2 + dc(-2) + e$$

$$47 = 16a + -8b + 4c + -2d + e$$

$$8 = a - b + c - d + e$$

$$0 \mid = e$$

$$2 = a + b + c + d + e$$

$$11 = 16a + 8b + 4c + 2d + e$$

$$\left[ \begin{array}{ccccc|c} a & b & c & d & e & Y \\ 16 & -8 & 4 & -2 & 1 & 47 \\ 1 & -1 & 1 & -1 & 1 & 8 \\ 0 & 0 & 0 & 0 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 2 \\ 16 & 8 & 4 & 2 & 1 & 11 \end{array} \right]$$

1)

d)  $A \cdot B$  is the genuine product of a pair of matrices: that is, it gives us the matrix where each element(s) in row  $i$  consists of a dot product of row  $i$ 's dot product with the column vector  $j$  in the other matrix.

$A \cdot B$  would be element wise multiplication, meaning each element  $C_{ij}$  is given by  $A_{ij} \cdot B_{ij}$ .

4)

a) A  $2 \times 4$  matrix can have a max of 4 ranks (1, 2, 3, and 4). and can have a nullity of 0, 1, or 2.  
 To this is intuition... I'm still very lost here. No idea how I would show this.

```

26 # 21007069
25 # (1)
24 # A)
23 disp("Question 1A")
22 A = [0 0 7; 0 6 9]
21 B = zeros(3, 2)
20 time = fix(clock())
19 B(1, 1) = time(1)
18 B(1, 2) = time(2)
17 B(2, 1) = time(3)
16 B(2, 2) = time(4)
15 B(3, 1) = time(5)
14 B(3, 2) = time(6)
13
12 # B)
11 disp("Question 1B")
10 C = A * B;
9 C
8
7 # C)
6 disp("Question 1C")
5 disp("D = C^5")
4 D = C^5;
3 D
2 disp("Rank(D)")
1 rank(D)
27
1 # (2)
2 # A)
3 disp("Question 2A")
4 A = zeros(6,6);
5 for i = 1:6
6   for j = 1:6
7     A(i, j) = j - i;
8   endfor
9 endfor
10 A
11 # B)
12 disp("Question 2B")
13 disp("Rank(A)")
14 rank(A)
15
16 disp("RREF(A)")
17 rrefA = rref(A)
18
19 rowSpace = A([1, 2], :)
20 colSpace = A'([1, 2], :)
21
22 # (3)
23 # A)
24 disp("Question 3A")
25 M = [16 -8 4 -2 1;
26   1 -1 1 -1 1;
27   0 0 0 0 1;
28   1 1 1 1 1;
29   16 8 4 2 1];
30 b = [47; 8; 1; 2; 11];
31
32 disp("RREF of M")
33 rref(M)
34 disp("Solution to M")
35 M\b
36
37 x = (-2:2);
38 fplot(@(x) ((x.^4) - 2*(x.^3) + 3 * (x.^2) - x + 1));
39 title("Ferns 21007069");
40 ylabel("Y-Axis");
41 xlabel("X-Axis");
42
43 # (4)
44 # (B)
45 disp("Question 4B")
46 a = randi([1 5], 4, 1)
47 b = randi([1 5], 4, 1)
48
49 a * b'
50 rank(ans)

```

Question 1A

A =

0	0	7
0	6	9

B =

0	0
0	0
0	0

time =

2022	5	2	5	17	23
------	---	---	---	----	----

B =

2022	0
0	0
0	0

B =

2022	5
0	0
0	0

B =

2022	5
2	0
0	0

B =

2022	5
2	5
0	0

B =

2022	5
2	5
17	0

B =

2022	5
2	5
17	23

Question 1B

C =

119	161
165	237

```
Question 1C  
D = C^5  
D =  
  
1.7656e+12    2.4861e+12  
2.5479e+12    3.5877e+12
```

```
Rank(D)  
ans = 2  
Question 2A  
A =
```

```
0   1   2   3   4   5  
-1  0   1   2   3   4  
-2  -1  0   1   2   3  
-3  -2  -1  0   1   2  
-4  -3  -2  -1  0   1  
-5  -4  -3  -2  -1  0
```

```
Question 2B  
Rank(A)  
ans = 2  
RREF(A)  
rrefA =
```

```
1   0   -1  -2  -3  -4  
0   1   2   3   4   5  
0   0   0   0   0   0  
0   0   0   0   0   0  
0   0   0   0   0   0  
0   0   0   0   0   0
```

```
rowSpace =  
  
0   -1  
1   0  
2   1  
3   2  
4   3  
5   4
```

```
colSpace =  
  
0   1  
-1  0  
-2  -1  
-3  -2  
-4  -3  
-5  -4
```

Question 3A

RREF of M

ans =

```
1 0 0 0 0
0 1 0 0 0
0 0 1 0 0
0 0 0 1 0
0 0 0 0 1
```

Solution to M

ans =

```
1
-2
3
-1
1
```

Question 4B

a =

```
3
2
4
4
```

b =

```
5
5
2
4
```

ans =

```
15 15 6 12
10 10 4 8
20 20 8 16
20 20 8 16
```

ans = 1

>> |

