Data605_HW3

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03/05/2023

Contents


```
library(pracma)
```

Problem Set 1

Q1 What is the rank of the matrix A?

```
A = matrix(c(1,2,3,4,-1,0,1,3,0,1,-2,1,5,4,-2,-3), nrow=4, byrow=TRUE)
A
```

```
##      [,1] [,2] [,3] [,4]
## [1,]    1    2    3    4
## [2,]   -1    0    1    3
## [3,]    0    1   -2    1
## [4,]    5    4   -2   -3
```

```
rref(A)
```

```
##      [,1] [,2] [,3] [,4]
## [1,]    1    0    0    0
## [2,]    0    1    0    0
## [3,]    0    0    1    0
## [4,]    0    0    0    1
```

Ans: Here we count the number of non zero linearly independent vectors rows, which is equal to 4.

Q2 Given an mxn matrix where m > n, what can be the maximum rank? The minimum rank, assuming that the matrix is non-zero?

Ans: If the matrix has (M > N), meaning rows than columns, the maximum rank is N. For minimum rank, since the matrix is non-zero, the rank is at least 1.

Q3 What is the rank of matrix B?

```
B = matrix(c(1,2,1,3,6,3,2,4,2), nrow=3, byrow=TRUE)
B
```

```
##      [,1] [,2] [,3]
## [1,]    1    2    1
## [2,]    3    6    3
## [3,]    2    4    2
```

```
rref(B)
```

```
##      [,1] [,2] [,3]
## [1,]    1    2    1
## [2,]    0    0    0
## [3,]    0    0    0
```

There is one (1) non-zero row, therefore the rank is 1.

Problem Set 2

Q

Compute the eigenvalues and eigenvectors of the matrix A.

```
C <- matrix(c(1,2,3,0,4,5,0,0,6), nrow=3, byrow=TRUE)
C
```

```
##      [,1] [,2] [,3]
## [1,]    1    2    3
## [2,]    0    4    5
## [3,]    0    0    6
```