Assignment 3

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## Assignment 3

we have a matric A . We are goijng to reduce the matrix to echelon form R2 <- R2 + R1 R4 <- R4 - 5R1

that will give us this matrix

we continue to break down the matrix so we can get the non zero rows

R2 <- 1/2R2

R4 <- R4 - 6R3

That will give us

R3 <- R3 + R4

R4 <- R4 + R4

Final matrix is

Therefore, n,r(A) = n . we imply that rank is 4

# initialize matrix  
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

# use matrix library   
library(Matrix)  
rankMatrix(A)[1][1]

## [1] 4

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

Thee maximum rank a matrix m x n can have the maximum rank of n because it is not possible to have more than n linearly independent columns. The minimum rank assuming the matrix is non-zero would be 1

#3 the rank for matrix

We are going to reduce the matrix to echelon form

R2 <- R2 -3R1

R3 <- R3 - 2R1

We will have this matrix:

Therefore, n,r(A) = n . we imply that rank is 1

B <- matrix(c(1,2,1,3,6,3,2,4,2), nrow = 3, ncol = 3, byrow = TRUE)  
B

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

rankMatrix(B)[1][1]

## [1] 1

## Q3

Lets a matrix

find the eigenvalues and eigenvectors:

## Step 1

so we have : $B =

* $

## Step 2

Eigenvalue will be 6 4 1

A <- matrix(c(1,2,3,0,4,5,0,0,6), nrow = 3, ncol = 3, byrow = TRUE)  
eigen(A)

## eigen() decomposition  
## $values  
## [1] 6 4 1  
##   
## $vectors  
## [,1] [,2] [,3]  
## [1,] 0.5108407 0.5547002 1  
## [2,] 0.7981886 0.8320503 0  
## [3,] 0.3192754 0.0000000 0

Calculate the eigenvector. we find the eigenvectors corresponding to each eigenvalue by solving the equation $(A-)v =0 $

for :

for

for :

for

# calculate the eigenvector  
A <- matrix(c(1,2,3,0,4,5,0,0,6), nrow = 3, ncol = 3, byrow = TRUE)  
  
eigen(A)[2]

## $vectors  
## [,1] [,2] [,3]  
## [1,] 0.5108407 0.5547002 1  
## [2,] 0.7981886 0.8320503 0  
## [3,] 0.3192754 0.0000000 0