Ejercicios estructuras de datos

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Ejercicio 1

Dad la entrada (2,2) de $A \cdot (A + A) \cdot A$, con

$$A = \begin{pmatrix} 1 & 3 \\ 2 & 4 \end{pmatrix}$$

```
A = rbind(c(1,3),c(2,4))
A
```

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

```
AA = A %*% (A+A) %*% A
AA
```

```
##      [,1] [,2]
## [1,]   74  162
## [2,]  108  236
```

La entrada (2,2) de la matriz solicitada es 236

Ejercicio 2

Dad los valores propios de la matriz

$$B = \begin{pmatrix} 2 & 4 & -6 \\ 0 & 0 & 3 \\ 0 & -2 & 5 \end{pmatrix}$$

```
B = rbind(c(2,4,-6), c(0,0,3), c(0,-2,5))
B
```

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

```
eigen(B)
```

```
## eigen() decomposition
## $values
## [1] 3 2 2
##
## $vectors
##            [,1] [,2]       [,3]
```

```
## [1,]  0.8164966    1  0.7071068
## [2,] -0.4082483    0 -0.5883484
## [3,] -0.4082483    0 -0.3922323
```

Los valores propios de B son 3, 2, 2

Ejercicio 3

Dad, redondeando a 3 cifras decimales, los vectores propios de la matriz

$$B = \begin{pmatrix} -48 & 35 & 12 \\ -134 & 95 & -32 \\ -194 & 133 & -44 \end{pmatrix}$$

```
C = rbind(c(2,4,-6), c(0,0,3), c(0,-2,5))
C
```

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

```
eigen(C)
```

```
## eigen() decomposition
## $values
## [1] 3 2 2
##
## $vectors
##            [,1] [,2]       [,3]
## [1,]  0.8164966    1  0.7071068
## [2,] -0.4082483    0 -0.5883484
## [3,] -0.4082483    0 -0.3922323
```

Los vectores propios de C son

```
##        [,1] [,2]   [,3]
## [1,]  0.816    1  0.707
## [2,] -0.408    0 -0.588
## [3,] -0.408    0 -0.392
```

Ejercicio 4

Dad el rango de la matriz

$$C = \begin{pmatrix} -2 & -8 & -2 & 3 \\ -3 & -6 & -1 & 2 \\ -9 & -22 & -3 & 7 \\ -18 & -44 & -8 & 15 \end{pmatrix}$$

```
D = rbind(c(-2,-8,-2,3), c(-3,-6,-1,2), c(-9,-22,-3,7), c(-18,-44,-8,15))
D
```

```
##      [,1] [,2] [,3] [,4]
## [1,]   -2   -8   -2    3
## [2,]   -3   -6   -1    2
## [3,]   -9  -22   -3    7
```

```
## [4,]  -18  -44   -8   15
```

```
qr(D)
```

```
## $qr
##            [,1]       [,2]       [,3]          [,4]
## [1,] 20.4450483 50.0854772  8.7062646 -1.687450e+01
## [2,]  0.1467348 -3.3830424 -1.1653959  1.428459e+00
## [3,]  0.4402044  0.3816312 -0.9180465  4.590232e-01
## [4,]  0.8804088  0.7632624 -0.2341267 -5.551115e-17
##
## $rank
## [1] 3
##
## $qraux
## [1] 1.097823e+00 1.521333e+00 1.972206e+00 5.551115e-17
##
## $pivot
## [1] 1 2 3 4
##
## attr(,"class")
## [1] "qr"
```

El rango de C es 3