Prractical 9

Solve the following matrix , given in augmented form by

(1) Gauss Elimination (REF)

(2) Gauss jordan (RREF)

$$\begin{bmatrix} 1 & 3 & 1 & : & 10 \\ 1 & 2 & -1 & : & -6 \\ 2 & 1 & 2 & : & 10 \end{bmatrix}$$

*Workout**

First of all we need to put the matrix in R

```
A<-matrix(c(1,3,1,10,1,2,-1,-6,2,1,2,10),byrow=T,ncol=4)
print(A)
```

```
##      [,1] [,2] [,3] [,4]
## [1,]    1    3    1   10
## [2,]    1    2   -1   -6
## [3,]    2    1    2   10
```

Now we need to create a function which can give RREF form of any augmented matrix given

```
#Gauss Jordan Elimination
r.ge_rref<-function(x)
{
r.jo1<-function(x)          # to reduce matrix in upper triangular matrix
{
  if(is.matrix(x)==1)
  {
    for(i in 2:nrow(x))
    {
      x[i,]<-x[i,]-x[i,1]*(x[1,]/x[1,1])
    }
    x[-1,-1]<-r.jo1(x[-1,-1])
  }
  x

}
r.ulta<-function(x) #A function which gives transpose of only coeeficient part
{
  y<-matrix(c(rev(x[1:9]),rev(x[10:12])),nrow=nrow(x),ncol=ncol(x),byrow=0)
  y
```

```
}
z<-r.ulta(r.jo1(r.ulta(r.jo1(x))))
for(i in 1:nrow(x))
  for(j in 1:nrow(x))
    if(i==j)
      z[i,]<-z[i,]/z[i,j]


x<-z
x
}
```

Now using the function on our matrix

```
rrefA<-r.ge_rref(A)
print(rrefA)
```

```
##      [,1] [,2] [,3] [,4]
## [1,]    1    0    0   -3
## [2,]    0    1    0    2
## [3,]    0    0    1    7
```

Now to get only row echloen form we need a slight change in some of the last lines of our function *r.ge_rref()* that is given by

```
#Gauss Elimination
r.ge_ref<-function(x)
{
r.jo1<-function(x)
{
  if(is.matrix(x)==1)
  {
    for(i in 2:nrow(x))
    {
      x[i,]<-x[i,]-x[i,1]*(x[1,]/x[1,1])
    }
    x[-1,-1]<-r.jo1(x[-1,-1])
  }
  x

}
r.ulta<-function(x)
{
  y<-matrix(c(rev(x[1:9]),rev(x[10:12])),nrow=nrow(x),ncol=ncol(x),byrow=0)
  y

}
z<-r.ulta(r.jo1(r.ulta(r.jo1(x))))
#for(i in 1:nrow(x))
 # for(j in 1:nrow(x))
  #  if(i==j)
  #    z[i,]<-z[i,]/z[i,j]
```

```
x<-z
x
}
```

To get REF we have to use r.ge_ref

```
refA<-r.ge_ref(A)
print(refA)
```

```
##      [,1] [,2] [,3] [,4]
## [1,]    1    0    0   -3
## [2,]    0   -1    0   -2
## [3,]    0    0   10   70
```

Conclusion

We get REF

$$\begin{bmatrix} 1 & 0 & 0 & -3 \\ 0 & -1 & 0 & -2 \\ 0 & 0 & 10 & 70 \end{bmatrix}$$

and RREF

$$\begin{bmatrix} 1 & 0 & 0 & -3 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 7 \end{bmatrix}$$