Week2_HW

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2/8/2018

Problem 2

```
factorization <- function(A){
  # 2x2 matrix
  if (nrow(A)==2){
    x <- -A[2,1]/A[1,1]
    S <- matrix (c(1,0,x,1), nrow=2, byrow=T)
    U <- S %*% A
    upper <- U
    print ("upper triangle matrix is")
    print(upper)

    S <- solve(S)
   print ("lower triangle matrix is ")
     print(S)

     (S %*% U == A)



   # 3x3
  } else if (nrow(A)==3){
    # eliminate the 2nd row and 1st column
    e21 <- -A[2,1]/A[1,1]
    matrixe21 <- matrix(c(1,0,0,e21,1,0,0,0,1),nrow=3, byrow=T)
    A2 <-matrixe21 %*% A

    # eliminae the 3rd row and 1st column
    e31 <- -A2[3,1]/A2[1,1]
    matrixe31 <- matrix(c(1,0,0,0,1,0,e31,0,1), nrow=3, byrow=T)
    A3 <- matrixe31 %*% A2

    # Eliminate the 3rd row and the second column
    e32 <- -A3[3,2]/A3[2,2]
    matrixe32 <- matrix(c(1,0,0,0,1,0,0,e32,1),3, byrow=T)
    U <- matrixe32 %*% A3
    print ("The upper triangle matrix is ")
    print(U)
```

```
    L <- solve(matrixe21) %*% solve(matrixe31) %*% solve(matrixe32)

    print ("The lower triangle matrix is ")
    print(L)

    (L %*% U ==A)
  }
}

A <- matrix(c(2,1,6,8), nrow=2, byrow=T)
factorization(A)

## [1] "upper triangle matrix is"
##      [,1] [,2]
## [1,]    2    1
## [2,]    0    5
## [1] "lower triangle matrix is "
##      [,1] [,2]
## [1,]    1    0
## [2,]    3    1

##      [,1] [,2]
## [1,] TRUE TRUE
## [2,] TRUE TRUE

B <- matrix(c(1,1,2,2,1,0,3,1,1), 3, byrow=T)
factorization(B)

## [1] "The upper triangle matrix is "
##      [,1] [,2] [,3]
## [1,]    1    1    2
## [2,]    0   -1   -4
## [3,]    0    0    3
## [1] "The lower triangle matrix is "
##      [,1] [,2] [,3]
## [1,]    1    0    0
## [2,]    2    1    0
## [3,]    3    2    1

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