**1. Create an m x n matrix with replicate(m, rnorm(n)) with m=10 column vectors of n=10 elements each,**

**constructed with rnorm(n), which creates random normal numbers.**

**Then we transform it into a dataframe (thus 10 observations of 10 variables) and perform an algebraic**

**operation on each element using a nested for loop: at each iteration, every element referred by the two**

**indexes is incremented by a sinusoidal function, compare the vectorized and non-vectorized form of creating**

**the solution and report the system time differences.**

***Ans:***

**#Vectorized form**

mat<- replicate(10,rnorm(10))

mat

df= data.frame(mat)

df<- df + 1\*sin(0.05\*pi)

df

**#non-vectorized form**

mat\_1<- replicate(10,rnorm(10))

mat\_1

df\_1= data.frame(mat\_1)

for(i in 1:10){

for(j in 1:10){

df\_1[i,j]<- df\_1[i,j] + 1\*sin(0.05\*pi)

print(df\_1)

}

}

**#time difference**

system.time(

df\_1[i,j]<- df\_1[i,j] + 1\*sin(0.05\*pi)

)

system.time(

for(i in 1:10){

for(j in 1:10){

df\_1[i,j]<- df\_1[i,j] + 1\*sin(0.05\*pi)

}

}

)