

Lab-3

1) Create the following matrix using R.

$$\begin{pmatrix} 3 & -2 & 3 & -1 & 0 \\ 3 & 20 & 6 & 8 & 9 \\ 2 & 12 & -17 & 12 & 5 \\ 1 & 2 & 8 & -9 & 10 \end{pmatrix}$$

```
> R <- matrix(c(3,-2,3,-1,0,3,20,6,8,9,2,12,-17,12,5,1,2,8,-9,10),nrow = 4, byrow = T)
> R
      [,1] [,2] [,3] [,4] [,5]
[1,]    3   -2    3   -1    0
[2,]    3   20    6    8    9
[3,]    2   12   -17   12    5
[4,]    1    2    8   -9   10
```

2) The data below contains missing values.

7,4,5,6,23,8,NA,34,23,56,NA,6,4,58,12,17,23, -10

a) Remove the missing values

```
> data <- c(7,4,5,6,23,8,NA,34,23,56,NA,6,4,58,12,17,23, -10)
> any(is.na(data))
[1] TRUE
> newdata <- data[!is.na(data)]
> newdata
[1] 7 4 5 6 23 8 34 23 56 6 4 58 12 17 23 -10
```

b) How many observations are less than 10?

```
> newdata
[1] 7 4 5 6 23 8 34 23 56 6 4 58 12 17 23 -10
> sum(newdata<10)
[1] 8
```

3) Create dataset data with sequence of numbers from 1 to 10 and insert comma (,) using the R code >paste(data, collapse=“,”)

```
> data <- 1:10
> data
[1] 1 2 3 4 5 6 7 8 9 10
> reqdata <- noquote(paste(data, collapse=“,”))
> reqdata
[1] 1,2,3,4,5,6,7,8,9,10
```

4) Consider the following two data sets:

Name	Age	Major	Gender
Tony	21	Math	Male
Drew	25	Math	Male
Nancy	27	STAT	Female

Name	Age	Major	Gender
Jay	23	CS	Male
Amanda	28	Math	Female
George	27	STAT	Male

a) Create two different data frames from the above observations and convert them to a single data frame.

```
> Name <- c("Tony", "Drew", "Nancy")
> Age <- c(21, 25, 27)
> Major <- c("Math", "Math", "STAT")
> Gender <- c("Male", "Male", "Female")
> table1 <- data.frame(Name, Age, Major, Gender)
> table1
  Name Age Major Gender
1 Tony  21  Math  Male
2 Drew  25  Math  Male
3 Nancy 27  STAT Female
>
> Name <- c("Jay", "Amanda", "George")
> Age <- c(23, 28, 27)
> Major <- c("CS", "Math", "STAT")
> Gender <- c("Male", "Female", "Male")
> table2 <- data.frame(Name, Age, Major, Gender)
> table2
  Name Age Major Gender
1  Jay  23   CS   Male
2 Amanda 28  Math Female
3 George 27  STAT   Male
>
> table <- rbind(table1, table2)
> table
  Name Age Major Gender
1 Tony  21  Math  Male
2 Drew  25  Math  Male
3 Nancy 27  STAT Female
4  Jay  23   CS   Male
5 Amanda 28  Math Female
6 George 27  STAT   Male
```

b) Sort the new data frame using Age.

```
> age_sorted_table <- table[order(table[, "Age"]), ]
> age_sorted_table
  Name Age Major Gender
1 Tony  21  Math  Male
4  Jay  23   CS   Male
2 Drew  25  Math  Male
3 Nancy 27  STAT Female
6 George 27  STAT   Male
```

5) If $\mathbf{A} = \begin{pmatrix} 3 & 2 & 1 & -3 \\ 2 & -4 & 3 & 0 \\ 6 & 0 & -1 & 5 \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} 2 & -3 & 7 & 6 \\ -4 & -5 & 0 & -2 \\ 2 & 4 & -3 & 5 \end{pmatrix}$ then calculate $\mathbf{A} + \mathbf{B}$ and $\mathbf{A} - \mathbf{B}$.

```
> A = matrix(c(3,2,1,-3,2,-4,3,0,6,0,-1,5),nrow=3,byrow=T)
> A
  [,1] [,2] [,3] [,4]
[1,]   3   2   1  -3
[2,]   2  -4   3   0
[3,]   6   0  -1   5
> B = matrix(c(2,-3,7,6,-4,-5,0,-2,2,4,-3,5),nrow=3,byrow=T)
> B
  [,1] [,2] [,3] [,4]
[1,]   2  -3   7   6
[2,]  -4  -5   0  -2
[3,]   2   4  -3   5
> A+B
  [,1] [,2] [,3] [,4]
[1,]   5  -1   8   3
[2,]  -2  -9   3  -2
[3,]   8   4  -4  10
> A-B
  [,1] [,2] [,3] [,4]
[1,]   1   5  -6  -9
[2,]   6   1   3   2
[3,]   4  -4   2   0
```

6) Using the matrix method, solve:

$$\begin{aligned} 3x - y &= 5 \\ -4x + 2y &= -9. \end{aligned}$$

```
> A = matrix(c(3,-1,-4,2),nrow=2,byrow=T)
> A
  [,1] [,2]
[1,]   3  -1
[2,]  -4   2
> Y = matrix(c(5,-9),nrow=2)
> Y
  [,1]
[1,]   5
[2,]  -9
> X = solve(A,Y)
> X
  [,1]
[1,]  0.5
[2,] -3.5
```