d,.— title: “Exercise 10.2” author: “Franchesca Johnson” date: “2023-08-11” output: pdf_document: default html_document: df_print: paged —

```
library(tidyverse)
```

```
## Warning: package 'tidyverse' was built under R version 4.3.1

## Warning: package 'ggplot2' was built under R version 4.3.1

## Warning: package 'tibble' was built under R version 4.3.1

## Warning: package 'tidyr' was built under R version 4.3.1

## Warning: package 'readr' was built under R version 4.3.1

## Warning: package 'purrr' was built under R version 4.3.1

## Warning: package 'dplyr' was built under R version 4.3.1

## Warning: package 'stringr' was built under R version 4.3.1

## Warning: package 'forcats' was built under R version 4.3.1

## Warning: package 'lubridate' was built under R version 4.3.1

## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.2     v readr     2.1.4
## v forcats   1.0.0     v stringr   1.5.0
## v ggplot2   3.4.2     v tibble    3.2.1
## v lubridate 1.9.2     v tidyr     1.3.0
## v purrr     1.0.1
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library(ggplot2)
```

```
summary(binary_classifier_data)
```

```
## Error in eval(expr, envir, enclos): object 'binary_classifier_data' not found
```

```
ggplot(binary_classifier_data, aes(x=x, y=y, color=label)) + geom_point() + scale_color_gradient2(low="
```

```
## Error in eval(expr, envir, enclos): object 'binary_classifier_data' not found
```

```
BinModel1 <- nls(label ~ sqrt((betaX - x )^2 + (betaY - y)^2), data=binary_classifier_data, start=list(
```

```
## Error in eval(expr, envir, enclos): object 'binary_classifier_data' not found
```

```
summary(BinModel1)
```

```
## Error in eval(expr, envir, enclos): object 'BinModel1' not found
```

```
ggplot(trinary_classifier_data, aes(x=x, y=y, color=label)) + geom_point() + scale_color_gradient2(low=
```

```
## Error in eval(expr, envir, enclos): object 'trinary_classifier_data' not found
```

```
TriModel1 <- nls(label ~ sqrt((betaX - x )^2 + (betaY - y)^2), data=trinary_classifier_data, start = lis
```

```
## Error in eval(expr, envir, enclos): object 'trinary_classifier_data' not found
```

```
summary(TriModel1)
```

```
## Error in eval(expr, envir, enclos): object 'TriModel1' not found
```

```
library(ggplot2)
library(tidyverse)
library(cluster)    # clustering algorithms

k_data <- c(3, 5, 10, 15, 20, 25)

kmeans(k_data, centers = 4, nstart = 20)
```

```
## K-means clustering with 4 clusters of sizes 2, 1, 2, 1
##
## Cluster means:
##   [,1]
## 1 12.5
## 2 20.0
## 3  4.0
## 4 25.0
##
## Clustering vector:
## [1] 3 3 1 1 2 4
##
## Within cluster sum of squares by cluster:
## [1] 12.5  0.0  2.0  0.0
##  (between_SS / total_SS =  96.1 %)
##
## Available components:
##
## [1] "cluster"      "centers"      "totss"        "withinss"     "tot.withinss"
## [6] "betweenss"    "size"         "iter"         "ifault"
```

```r
e_clusters <- 6
wss10 <- numeric(e_clusters)

for (i in k_data){
  km.out1 <- kmeans(df, centers = i, nstart = 1)
  wss10[i] <- km.out$tot.withinss
}
```

```
## Error in as.vector(x, mode): cannot coerce type 'closure' to vector of type 'any'
```

```r
wss10
```

```
## [1] 0 0 0 0 0 0
```

```r
wss10 <- na.omit(wss10)
wss10
```

```
## [1] 0 0 0 0 0 0
```

```r
# function to compute total within-cluster sum of square
wss <- function(k) {
  kmeans(k_data, k, nstart = 4)$tot.withinss
}
```