HW4_Lin_Zhengzhi

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problem 4

The first one way is to code regularly, by creating a lot variables. This way of coding is easy at when doing the project, but it is hard to review. The second way is using pipe to avoid creating variables, this makes code clean and tidy, easy to read and review.

problem 5

```
library(dplyr)
```

```
## Warning: package 'dplyr' was built under R version 3.5.1

##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
url <- "https://www2.isye.gatech.edu/~jeffwu/wuhamadabook/data/Sensory.dat"
operator <- read.table(url, fill = TRUE)
op_dat <- as.matrix(operator[-c(1:2), ])
for (i in 1:10) {
  t <- op_dat[3 * i - 1, 1:5]
  t <- c(i, t)
  op_dat[3 * i - 1, ] <- t
  m <- op_dat[3 * i, 1 : 5]
  m <- c(i, m)
  op_dat[3 * i, ] <- m
}
op_dat <- op_dat %>% as.data.frame() %>% rename(item = V1,
         operator1 = V2, operator2 = V3, operator3 = V4, operator4 = V5,
         operator5 = V6) %>%
  mutate_if(is.factor, as.character) %>% mutate_if(is.character, as.numeric )
head(op_dat)
```

```
##   item operator1 operator2 operator3 operator4 operator5
## 1    1       4.3       4.9       3.3       5.3       4.4
## 2    1       4.3       4.5       4.0       5.5       3.3
## 3    1       4.1       5.3       3.4       5.7       4.7
## 4    2       6.0       5.3       4.5       5.9       4.7
## 5    2       4.9       6.3       4.2       5.5       4.9
## 6    2       6.0       5.9       4.7       6.3       4.6
```

```
op_dat %>% str() %>% summary()
```

```
## 'data.frame':    30 obs. of  6 variables:
##  $ item     : num  1 1 1 2 2 2 3 3 3 4 ...
##  $ operator1: num  4.3 4.3 4.1 6 4.9 6 2.4 3.9 1.9 7.4 ...
##  $ operator2: num  4.9 4.5 5.3 5.3 6.3 5.9 2.5 3 3.9 8.2 ...
##  $ operator3: num  3.3 4 3.4 4.5 4.2 4.7 2.3 2.8 2.6 6.4 ...
##  $ operator4: num  5.3 5.5 5.7 5.9 5.5 6.3 3.1 2.7 4.6 6.8 ...
##  $ operator5: num  4.4 3.3 4.7 4.7 4.9 4.6 2.4 1.3 2.2 6 ...

## Length  Class   Mode
##      0   NULL   NULL
```

```
url <- "https://www2.isye.gatech.edu/~jeffwu/wuhamadabook/data/LongJumpData.dat"
olympic <- read.table(url, fill = TRUE)
olympic <- olympic[- 1, ]
o1 <- olympic[, 1 : 2] %>% rename(year = V1, "Long jump" = V2) %>%
  mutate_if(is.factor, as.character) %>% mutate_if(is.character, as.numeric)
o2 <- olympic[, 3 : 4] %>% rename(year = V3, "Long jump" = V4) %>%
  mutate_if(is.factor, as.character) %>% mutate_if(is.character, as.numeric)
o3 <- olympic[, 5 : 6] %>% rename(year = V5, "Long jump" = V6) %>%
  mutate_if(is.factor, as.character) %>%
  mutate_if(is.character, as.numeric)
o4 <- olympic[, 7 : 8] %>% rename(year = V7, "Long jump" = V8) %>%
  mutate_if(is.factor, as.character) %>%
  mutate_if(is.character, as.numeric)

oly_dat <- o1 %>%
  bind_rows(o2) %>% bind_rows(o3) %>% bind_rows(o4)
head(oly_dat)
```

```
##   year Long jump
## 1   -4    249.75
## 2    0    282.88
## 3    4    289.00
## 4    8    294.50
## 5   12    299.25
## 6   20    281.50
```

```
oly_dat %>% str() %>% summary()
```

```
## 'data.frame':    24 obs. of  2 variables:
##  $ year     : num  -4 0 4 8 12 20 24 28 32 36 ...
##  $ Long jump: num  250 283 289 294 299 ...

## Length  Class   Mode
##      0   NULL   NULL
```

```r
url <- "https://www2.isye.gatech.edu/~jeffwu/wuhamadabook/data/BrainandBodyWeight.dat"
weight <- read.table(url, fill = TRUE)
weight <- weight[- 1, 1 : 6]
w1 <- weight[, 1 : 2] %>%  rename("Body Wt" = V1, "Brain Wt" = V2) %>%
  mutate_if(is.factor, as.character) %>% mutate_if(is.character, as.numeric)
w2 <- weight[, 3 : 4] %>%  rename("Body Wt" = V3, "Brain Wt" = V4) %>%
  mutate_if(is.factor, as.character) %>% mutate_if(is.character, as.numeric)
w3 <- weight[, 5 : 6] %>%  rename("Body Wt" = V5, "Brain Wt" = V6) %>%
  mutate_if(is.factor, as.character) %>%
  mutate_if(is.character, as.numeric)
weight_dat <- w1 %>%
  bind_rows(w2) %>% bind_rows(w3)
head(weight_dat)
```

```
##   Body Wt Brain Wt
## 1   3.385     44.5
## 2   0.480     15.5
## 3   1.350      8.1
## 4 465.000    423.0
## 5  36.330    119.5
## 6  27.660    115.0
```

```r
weight_dat %>% str() %>% summary()
```

```
## 'data.frame':    63 obs. of  2 variables:
##  $ Body Wt : num  3.38 0.48 1.35 465 36.33 ...
##  $ Brain Wt: num  44.5 15.5 8.1 423 119.5 ...
```

```
## Length  Class   Mode
##      0   NULL   NULL
```

```r
url <- "https://www2.isye.gatech.edu/~jeffwu/wuhamadabook/data/tomato.dat"
tomato <- read.csv(url, sep = "\t")
tomato < - tomato %>% mutate_if(is.factor, as.character)
```

```
## Warning in Ops.factor(left): '-' not meaningful for factors
```

```
## Warning in Ops.factor(left, right): '<' not meaningful for factors
```

```
##      X.this.needs.reformatting.to.read.into.Splus
## [1,]                                           NA
## [2,]                                           NA
## [3,]                                           NA
```

```r
size <- paste(tomato[1, ])
size <- strsplit(size, " ")
size <- size[[1]][size[[1]] != ""]
size <- as.numeric(size[1 : 3])
size <- as.vector(size)
```

```
ife <- paste(tomato[2, ])
ife <- strsplit(ife, " ")
ife <- ife[[1]][ife[[1]] != ""]
ife[2 : 4] <- strsplit(ife[2: 4], ",")
name <- as.matrix(rep(ife[[1]], 3))
ife <- rbind(ife[[2]], ife[[3]], ife[[4]])
ife <- ife %>%
  cbind(name) %>%
  cbind(c(1000, 2000, 3000))

pusa <- paste(tomato[3, ])
pusa <- strsplit(pusa, " ")
pusa <- pusa[[1]][pusa[[1]] != ""]
pusa[2 : 4] <- strsplit(pusa[2:4], ",")
name <- as.matrix(rep(pusa[[1]], 3))
pusa <- rbind(pusa[[2]], pusa[[3]], pusa[[4]])
pusa <- pusa %>%
  cbind(name) %>%
  cbind(c(1000, 2000, 3000))
tomato_dat <- rbind(pusa, ife)
tomato_dat <- tomato_dat %>% as.data.frame()
colnames(tomato_dat) <- c("1st", "2nd", "3rd", "name", "plant density")
tomato_dat <- tomato_dat[, c("name", "plant density", "1st", "2nd", "3rd")]

tomato_dat[, 2 : 5] <- tomato_dat[, 2 : 5] %>%
  mutate_if(is.factor, as.character) %>%
  mutate_if(is.character, as.numeric)

head(tomato_dat)
```

```
##              name plant density  1st  2nd  3rd
## 1 PusaEarlyDwarf          1000  8.1  8.6 10.1
## 2 PusaEarlyDwarf          2000 12.7 13.7 11.5
## 3 PusaEarlyDwarf          3000 14.4 15.4 13.7
## 4        Ife\\#1          1000 16.1 15.3 17.5
## 5        Ife\\#1          2000 16.6 19.2 18.5
## 6        Ife\\#1          3000 20.8 18.0 21.0
```

```
tomato_dat %>% str() %>% summary()
```

```
## 'data.frame':    6 obs. of  5 variables:
##  $ name         : Factor w/ 2 levels "Ife\\#1","PusaEarlyDwarf": 2 2 2 1 1 1
##  $ plant density: num  1000 2000 3000 1000 2000 3000
##  $ 1st          : num  8.1 12.7 14.4 16.1 16.6 20.8
##  $ 2nd          : num  8.6 13.7 15.4 15.3 19.2 18
##  $ 3rd          : num  10.1 11.5 13.7 17.5 18.5 21
```

```
## Length  Class   Mode
##      0   NULL   NULL
```

Problem 6

```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 3.5.1
```

```
library(gridExtra)
```

```
## Warning: package 'gridExtra' was built under R version 3.5.3
```

```
##
## Attaching package: 'gridExtra'
```

```
## The following object is masked from 'package:dplyr':
##
##     combine
```

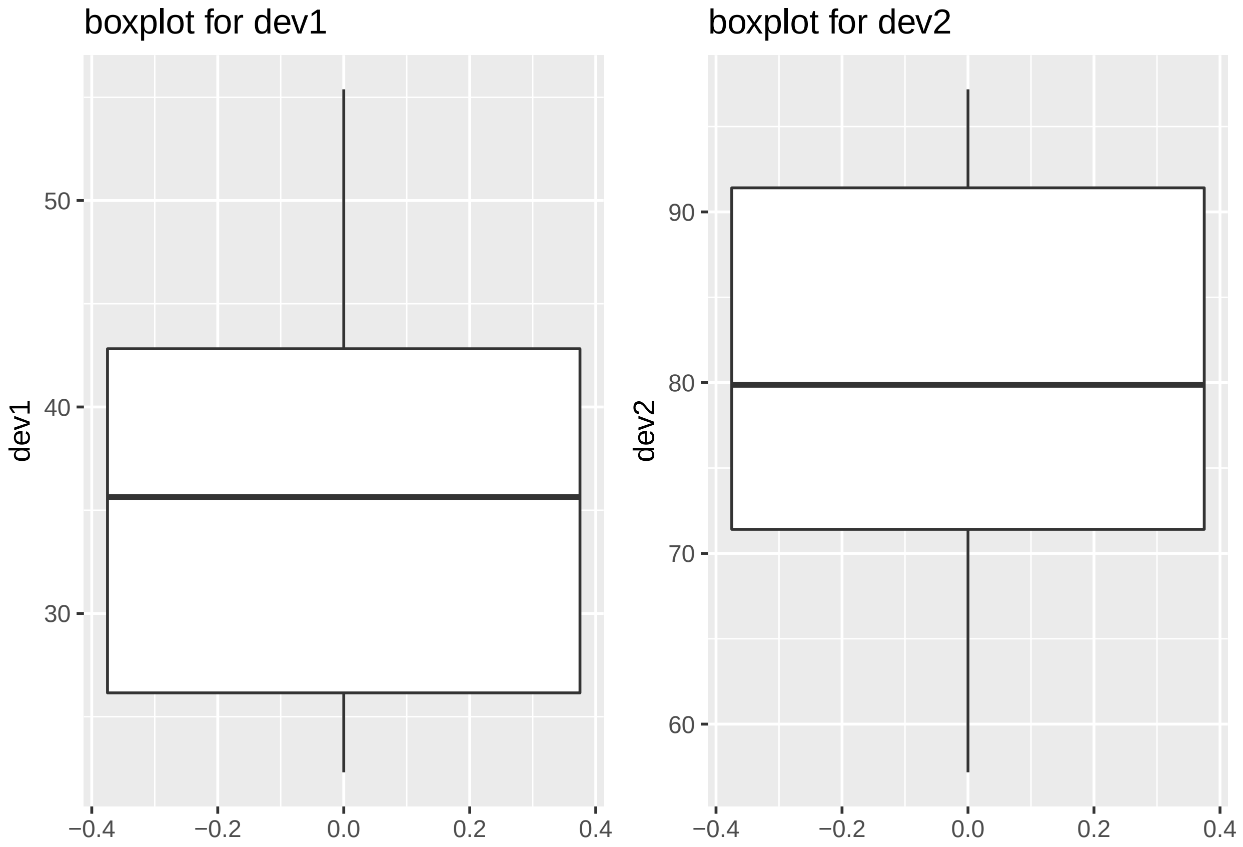
```
dat_ori <- readRDS("HW4_data.rds", refhook = NULL)
dat <- dat_ori[1:13,]

#my function
func_stat <- function(){
  mean <- mean(dat$dev1)
  mean2 <- mean(dat$dev2)
  sd <- sqrt(var(dat$dev1))
  sd2 <- sqrt(var(dat$dev2))
  corelation <- cor(dat$dev1, dat$dev2)
  tab <- as.data.frame(cbind(mean, mean2, sd, sd2, corelation))
  names(tab) <- c("dev1 mean", "dev2 mean", "dev1 sd", "dev2 sd", "correlation")
  return(tab)
}
func_stat()
```

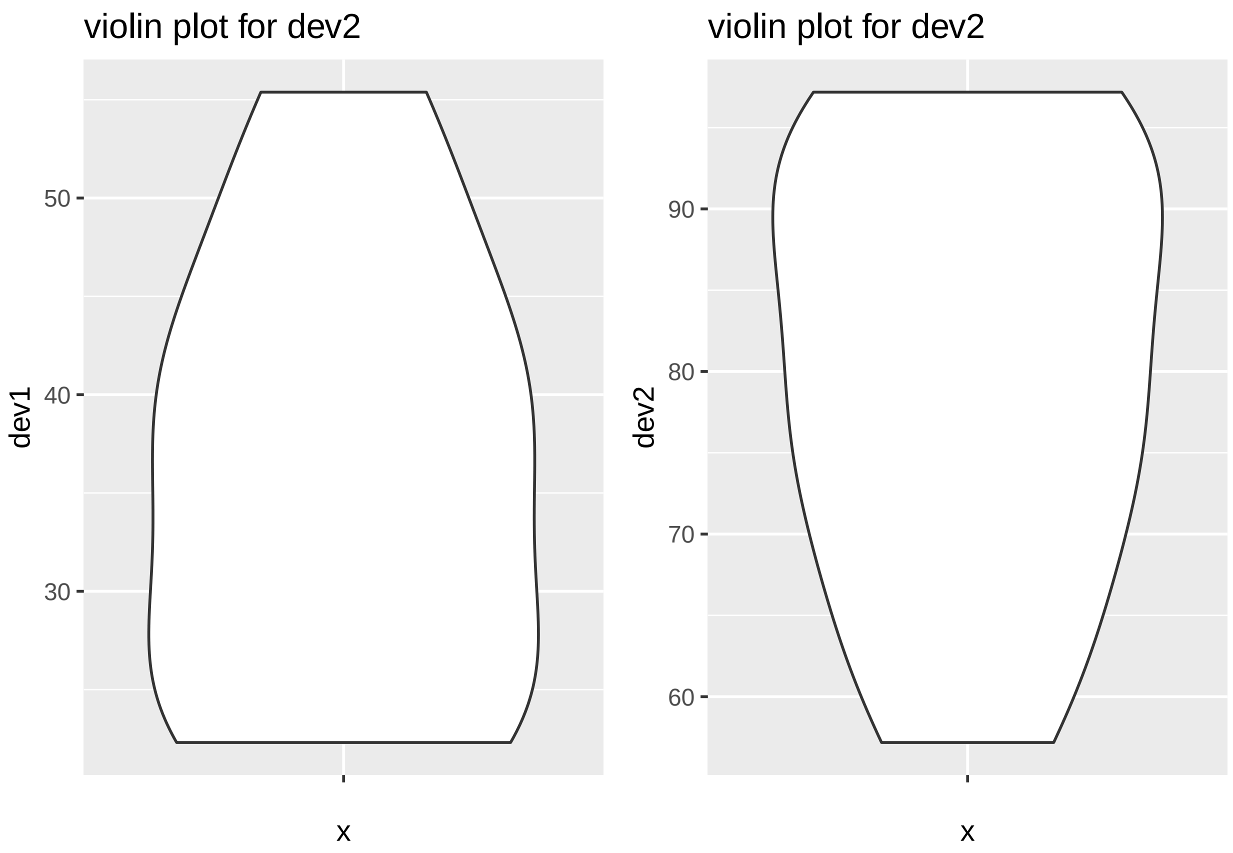
```
##   dev1 mean dev2 mean  dev1 sd  dev2 sd correlation
## 1  35.91715  80.07891 11.15726 13.32958   0.9681702
```

```
p <- ggplot(data = dat)
p1 <- p + geom_boxplot(aes(y = dev1)) + ggtitle("boxplot for dev1")
p2 <- p + geom_boxplot(aes(y = dev2)) + ggtitle("boxplot for dev2")
p3 <- p + geom_violin(aes(x = "",y = dev1)) + ggtitle("violin plot for dev2")
p4 <- p + geom_violin(aes(x = "",y = dev2)) + ggtitle("violin plot for dev2")

grid.arrange(p1, p2, ncol = 2)
```



```r
grid.arrange(p3, p4, ncol = 2)
```



Problem 7

Reimann sum is .8556252

```
func.1 <- function(x){
  y <- exp(- x ^ 2 / 2)
  return(y)
}
x <- seq(0, 1, by = 1e-6)
sum(func.1(x) * (1e-6))
```

```
## [1] 0.8556252
```

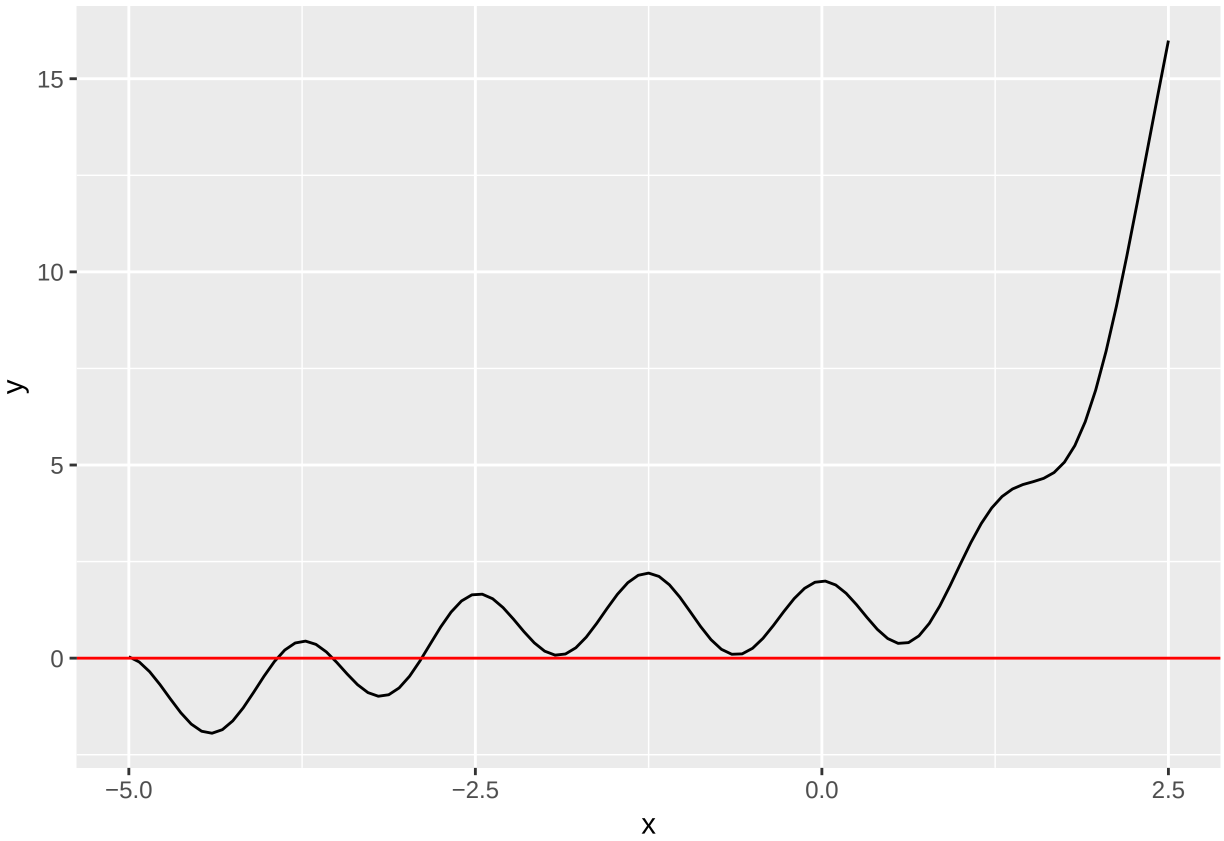
Problem 8

One of solutions is x = - 3.930114

```
library(ggplot2)
func <- function(x){
  y <- 3 ^ x - sin(x) + cos(5 * x)
  return(y)
}
```

```
d_func <- function(x){
  y <- 3 ^ x * log(3) - cos(x) - 5 * sin(5 * x)
  return(y)
}

ggplot(data = data.frame(x = 0,y = 0), mapping = aes(x = x)) +
  stat_function(fun = func) +
  xlim(-5, 2.5) +
  geom_abline(intercept = 0, slope = 0, colour = "red")
```



```
x_0 <- -2.5
eps <- 1e-6
x <- x_0
while (abs(func(x)-0) > eps) {
  x <- x - func(x)/d_func(x)
}
x
```

```
## [1] -3.930114
```