HW3-MATH4322

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Question 1 (a):

$$\hat{y} = -6 + 0.05 * hours + 1 * undergradGPA + \epsilon$$

if hours = 40 & undergrad GPA = 3.5 so,

$$\hat{y} = -6 + 0.05 * 40 + 1 * 3.5$$

```
prob<- exp(-6+(0.05*40)+(1*3.5))
q1<-prob/(1+prob)
q1
```

```
## [1] 0.3775407
```

Question 1 (b):
p(X)=.5
log(P(X)/1-P(X)) = b0+b1*x1

```
log(.5/(1-.5))
```

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

0 = -2.5+0.05*hours
2.5/0.05 = 50
The amount of hours needed to study to achieve an A is 50 hours
Question 2 (a):

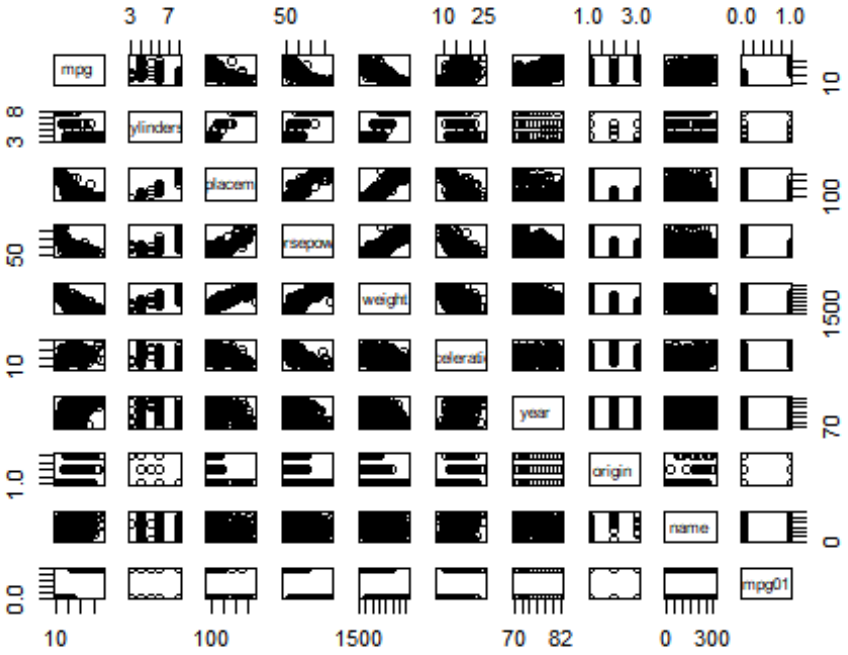
```
library(ISLR)
```

```
## Warning: package 'ISLR' was built under R version 4.1.3
```

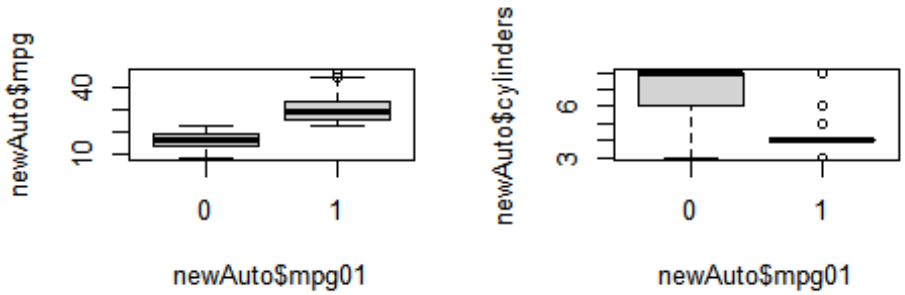
```
newAuto <- data.frame(Auto)
mpg.med <- median(Auto$mpg)
newAuto$mpg01 <- ifelse(Auto$mpg > mpg.med, yes = 1,no=0)
```

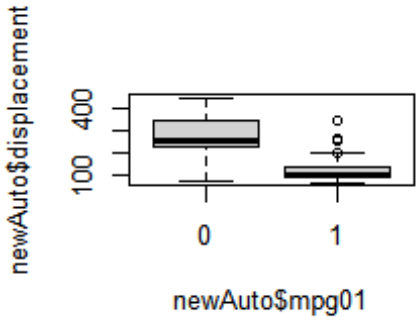
Question 2 (b):

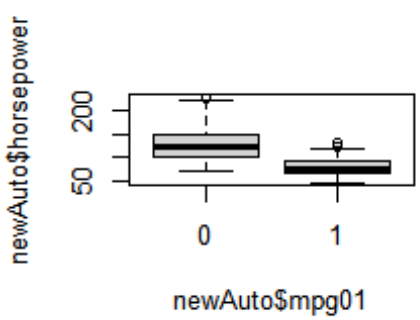
```
pairs(newAuto)
```



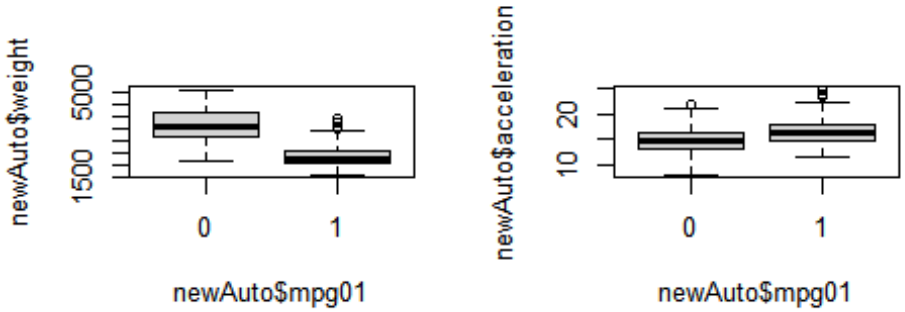

```
par(mfrow=c(2,2))
boxplot(newAuto$mpg~newAuto$mpg01)
boxplot(newAuto$cylinders~newAuto$mpg01)
boxplot(newAuto$displacement~newAuto$mpg01)
boxplot(newAuto$horsepower~newAuto$mpg01)
```

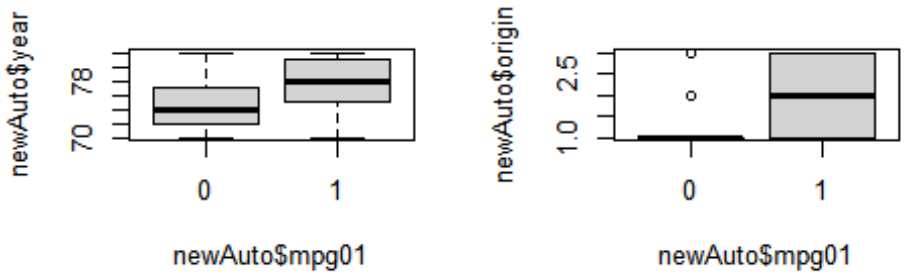







```
boxplot(newAuto$weight~newAuto$mpg01)
boxplot(newAuto$acceleration~newAuto$mpg01)
boxplot(newAuto$year~newAuto$mpg01)
boxplot(newAuto$origin~newAuto$mpg01)
```





The best predictors seem to be the variable cylinders, displacement, horsepower, and weight

Question 2 (c):

```
set.seed(1)
n <- nrow(newAuto)
train <- sample(1:n,0.7*n)
auto.train <- newAuto[train,]
auto.test <- newAuto[-train,]
```

Question 2 (d):

```
auto.glm <- glm(mpg01~cylinders+displacement+horsepower+weight,data =
newAuto, family = "binomial")
#summary(auto.glm)
glm.pred <- predict.glm(auto.glm,newdata = auto.test,type = "response")
yhat <- glm.pred > 0.5
table(auto.test$mpg01,yhat)

##    yhat
##     FALSE TRUE
##   0    53    8
##   1     3   54

mean(yhat!=auto.test$mpg01)
```

```
## [1] 0.09322034
```

The test error rate is (3+6)/(51+58+6+3) = 0.07627119
Question 3 (a):

```
Power<- function(x=2,a=3){
  result <- x^a
  print(result)
}
Power()

## [1] 8
```

Question 3 (b):

```
Power2 <- function(x,a){
  result <-x^a
  print(result)
}
Power2(3,8)

## [1] 6561
```

Question 3 (c):

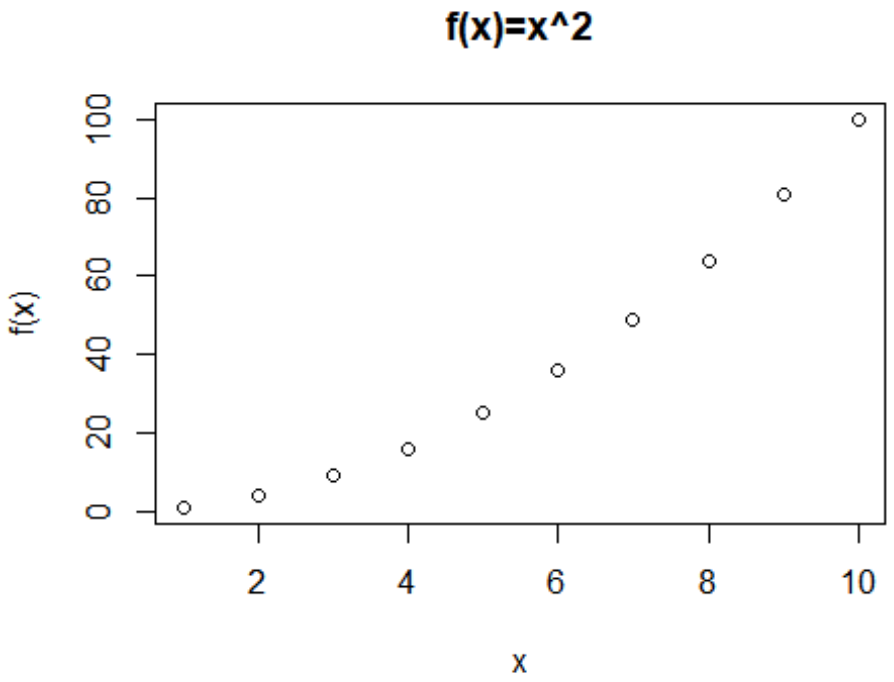
```
Power2(10,3)

## [1] 1000

Power2(8,17)

## [1] 2.2518e+15

Power2(131,3)

## [1] 2248091
```

Question 3 (d):

```
Power3 <- function(x,a){
  result <- x^a
  return(result)
}
```

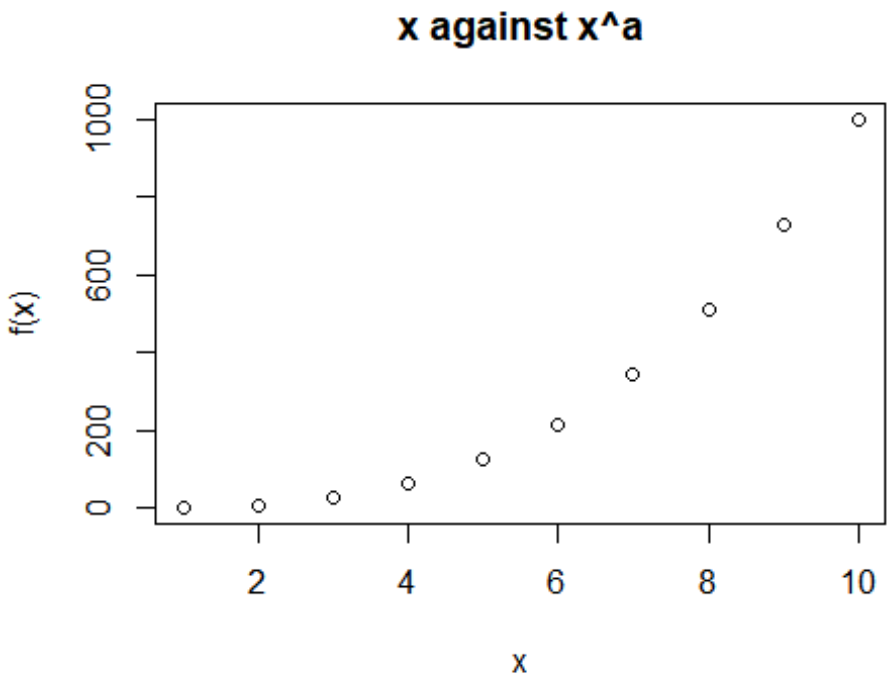
Question 3 (e):

```
x <- 1:10
plot(x,Power3(x,2),main="f(x)=x^2",ylab = "f(x)",xlab="x")
```



Question 3 (f):

```
PlotPower <- function(x,a){
  x<-seq(min(x),max(x))
  plot(x,Power3(x,a),main = "x against x^a",ylab = "f(x)",xlab = "x")
}
PlotPower(1:10,3)
```


x against x^a
f(x)
0
200
600
1000
2
4
6
8
10
x