ST443 Lab1

29 September 2020

Lab 1.1 - Basic Commands

```
x<-c(1,3,2,5)
x
```

```
## [1] 1 3 2 5
```

```
x=c(1,6,2)
x
```

```
## [1] 1 6 2
```

```
y=c(1,4,3)
x+y
```

```
## [1]  2 10  5
```

```
ls()
```

```
## [1] "x" "y"
```

```
rm(x,y) ## rm(list=ls(all=TRUE)) ##remove all variables (clean up)
ls()
```

```
## character(0)
```

```
x=matrix(c(1,2,3,4),2,2)
x
```

```
##      [,1] [,2]
## [1,]    1    3
## [2,]    2    4
```

```
x=matrix(c(1,2,3,4),2,2,byrow = T)
x
```

```
##      [,1] [,2]
## [1,]    1    2
## [2,]    3    4
```

```
sqrt(x)
```

```
##          [,1]     [,2]
## [1,] 1.000000 1.414214
## [2,] 1.732051 2.000000
```

```
x^2
```

```
##      [,1] [,2]
## [1,]    1    4
## [2,]    9   16
```

```r
x=rnorm(50)

y=x+rnorm(50,sd=.1)
cor(x,y)
```

```
## [1] 0.9941514
```

```r
mean(y)
```

```
## [1] 0.08923452
```

```r
var(y)
```

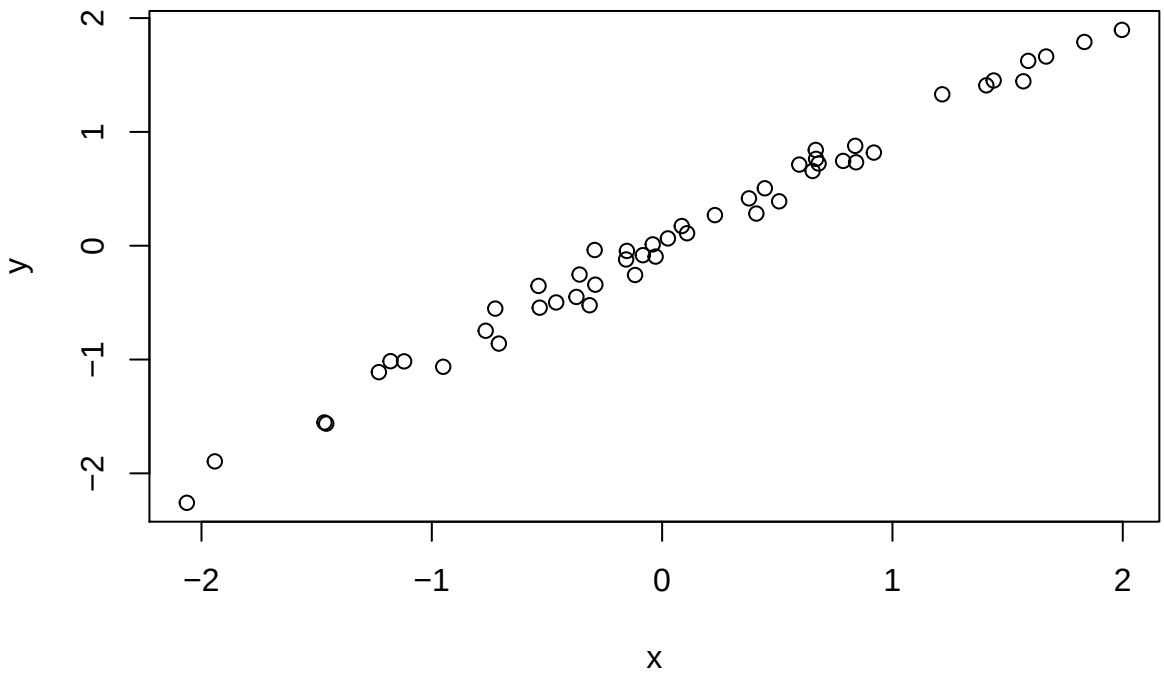
```
## [1] 0.9556032
```

```r
sqrt(var(y))
```

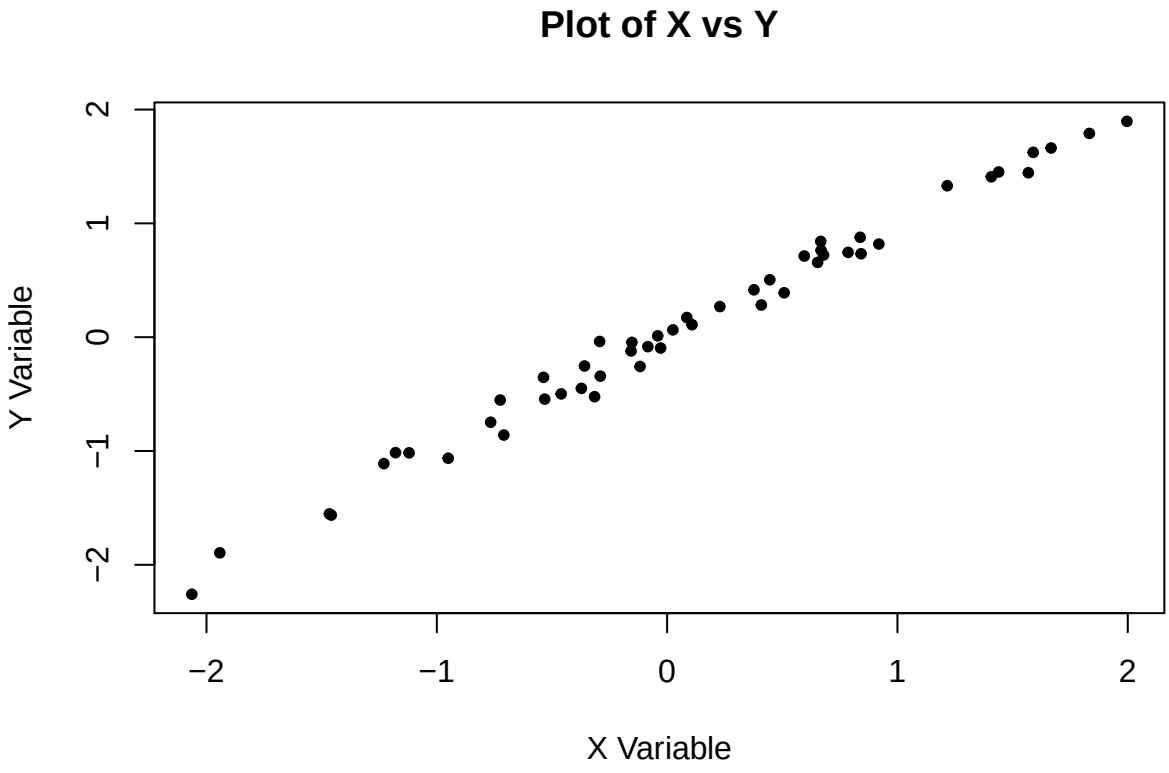
```
## [1] 0.9775496
```

Lab 1.2 - Graphics

```r
plot(x,y)
```




```r
plot(x,y,xlab="X Variable", ylab="Y Variable", main="Plot of X vs Y",pch=20)
```



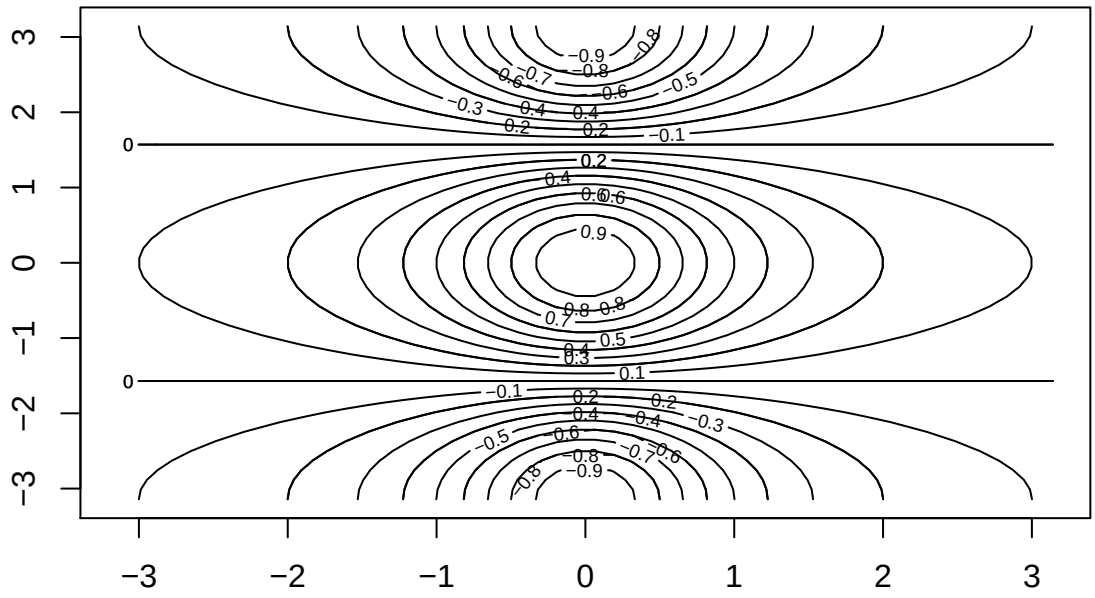

```
x=seq(1,10)
x
```

```
##  [1]  1  2  3  4  5  6  7  8  9 10
```

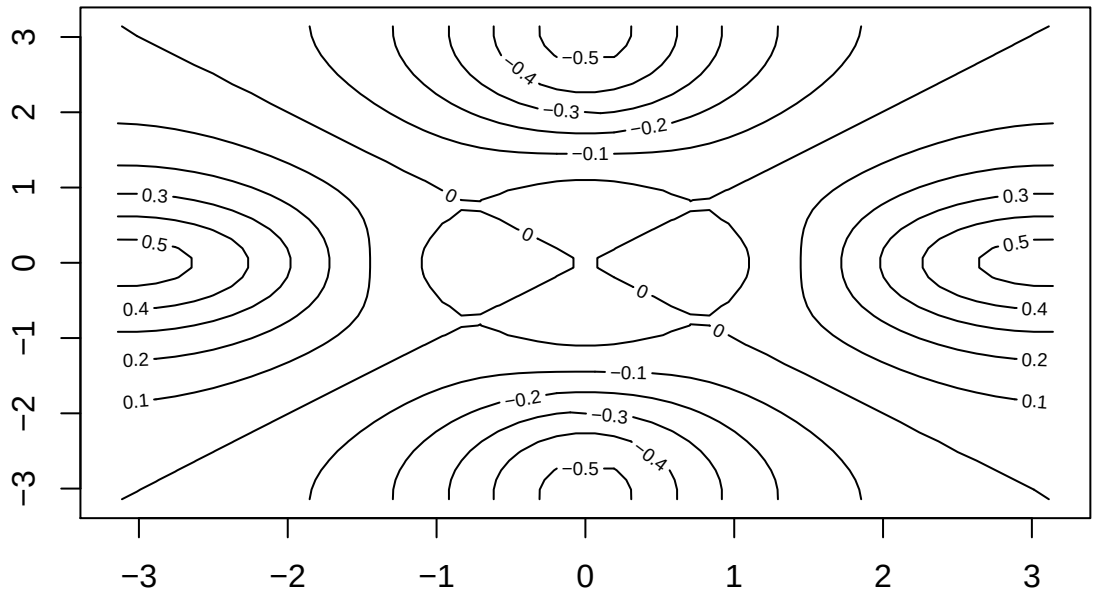
```
x=1:10
x
```

```
##  [1]  1  2  3  4  5  6  7  8  9 10
```

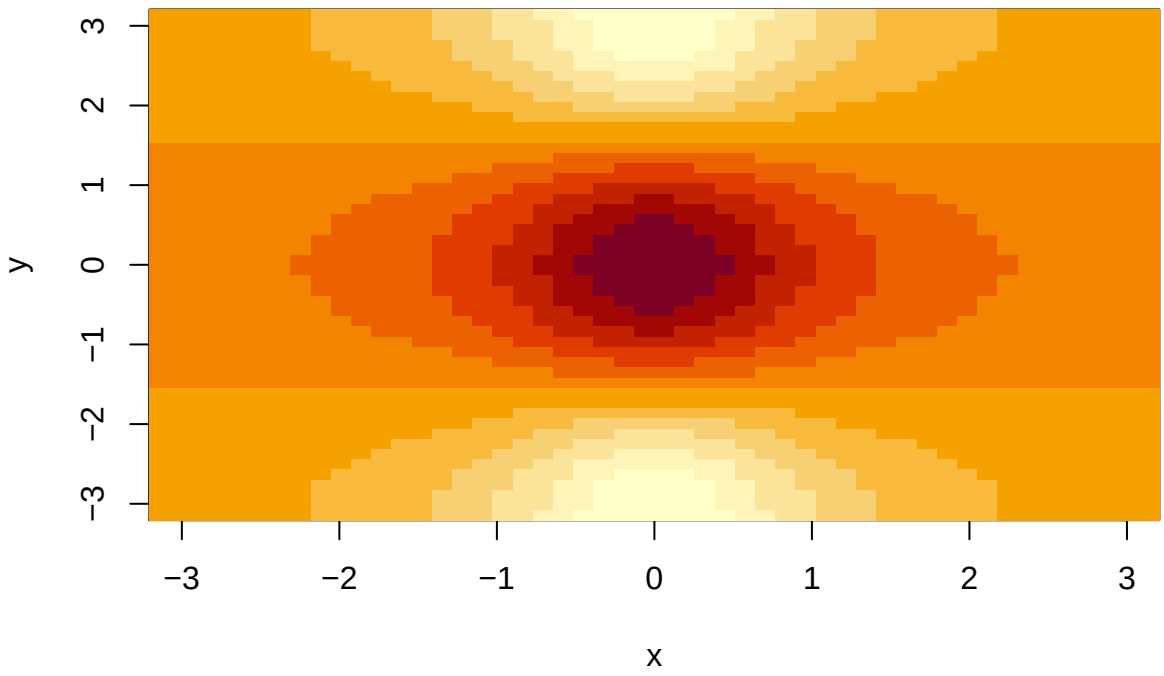
```
x=seq(-pi,pi,length=50)
y=x
f=outer(x,y,function(x,y)cos(y)/(1+x^2))
contour(x,y,f)
contour(x,y,f,nlevels=15,add=T)
```



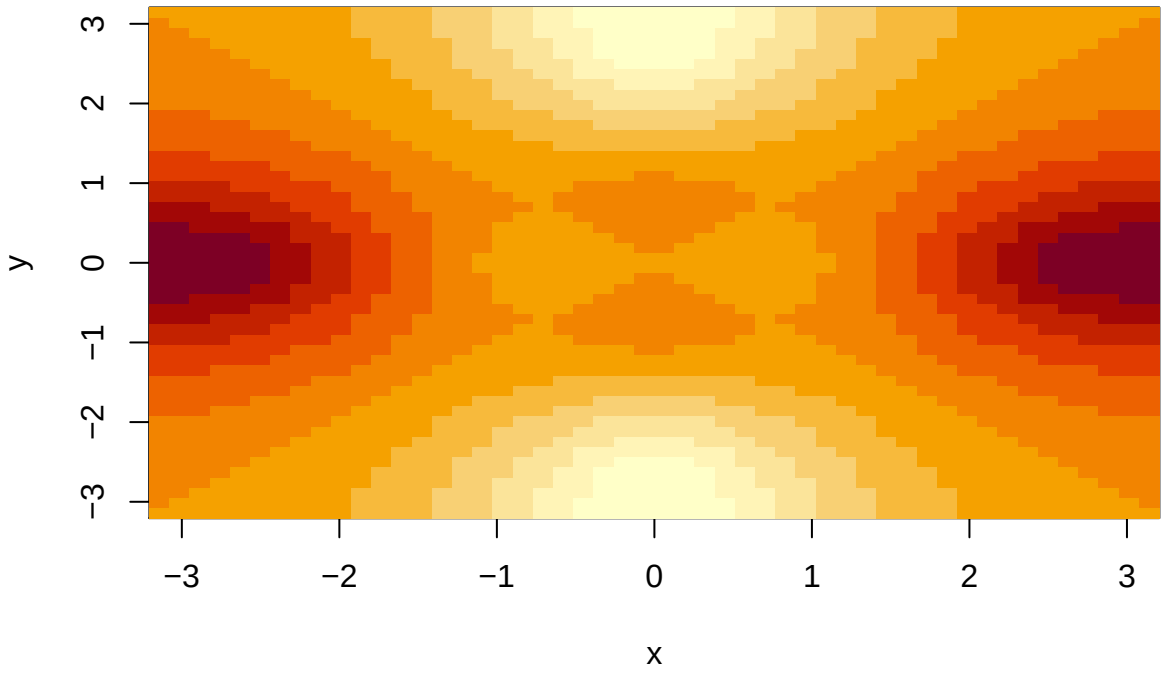

```
fa=(f-t(f))/2
contour(x,y,fa,nlevels=15)
```



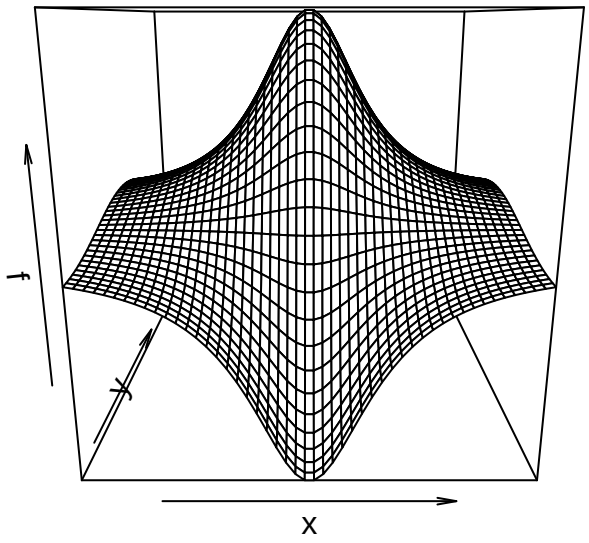

```
image(x,y,f)
```



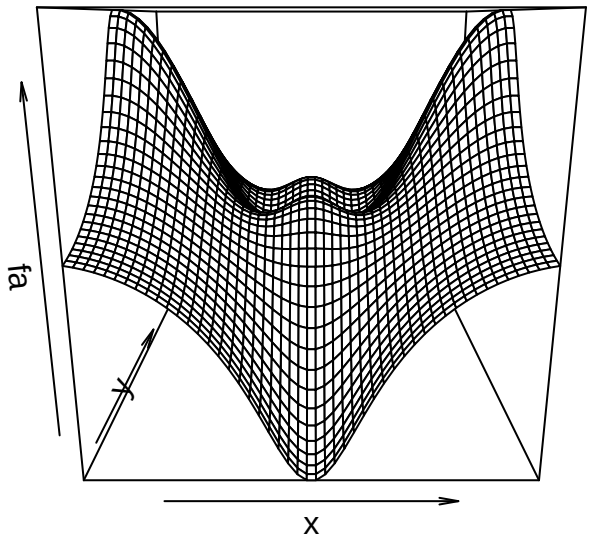

```
image(x,y,fa)
```



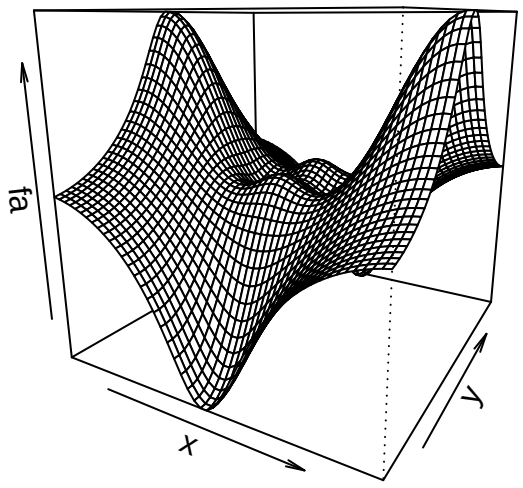

```
persp(x,y,f)
```



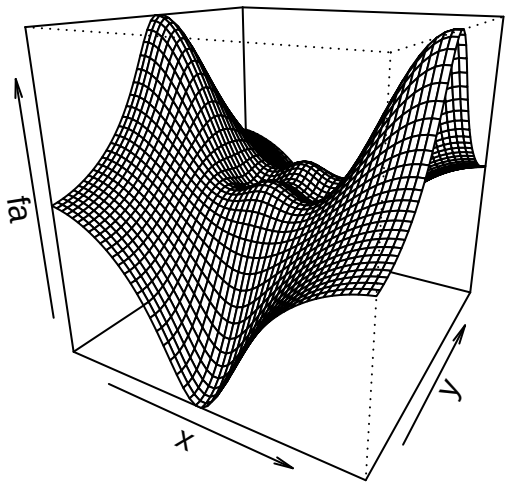

```
persp(x,y,fa)
```



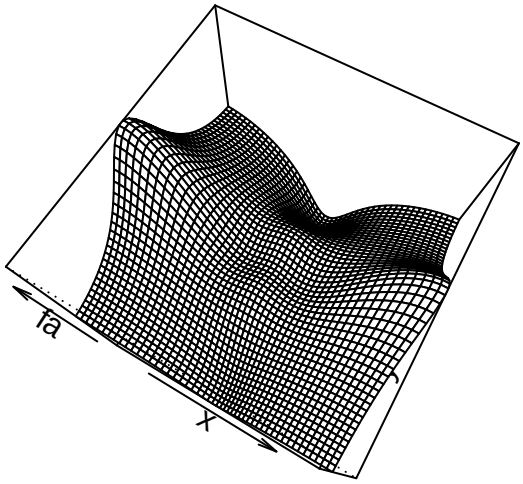

```
persp(x,y,fa,theta=30)
```




```
persp(x,y,fa,theta=30,phi=20)
```




```
persp(x,y,fa,theta=30,phi=70)
```



Lab 1.3 - Indexing Data

```
A=matrix(1:16,4,4)
A
```

```
##      [,1] [,2] [,3] [,4]
## [1,]    1    5    9   13
## [2,]    2    6   10   14
## [3,]    3    7   11   15
## [4,]    4    8   12   16
```

```
A[2,3]
```

```
## [1] 10
```

```
A[c(1,3),c(2,4)]
```

```
##      [,1] [,2]
## [1,]    5   13
## [2,]    7   15
```

```
A[1:3,2:4]
```

```
##      [,1] [,2] [,3]
## [1,]    5    9   13
## [2,]    6   10   14
## [3,]    7   11   15
```

```
A[1:2,]
```

```
##      [,1] [,2] [,3] [,4]
## [1,]    1    5    9   13
## [2,]    2    6   10   14
```

```
A[,1:2]
```

```
##      [,1] [,2]
## [1,]    1    5
## [2,]    2    6
## [3,]    3    7
## [4,]    4    8
```

```
A[-c(1,3),]
```

```
##      [,1] [,2] [,3] [,4]
## [1,]    2    6   10   14
## [2,]    4    8   12   16
```

```
A[-c(1,3),-c(1,3,4)]
```

```
## [1] 6 8
```

```
dim(A)
```

```
## [1] 4 4
```

Lab 1.4 - Loading Data

```
# setwd("C:/Users/CHENC45/Desktop/Lab1")
auto=read.table("auto_mpg.data")
View(auto)
auto=read.table("auto_mpg.data",na.strings="?")
View(auto)
auto=read.csv("auto_mpg.csv",header=T,na.strings="?")
View(auto)
dim(auto)
```

```
## [1] 397   9
```

```
auto=na.omit(auto)
dim(auto)
```

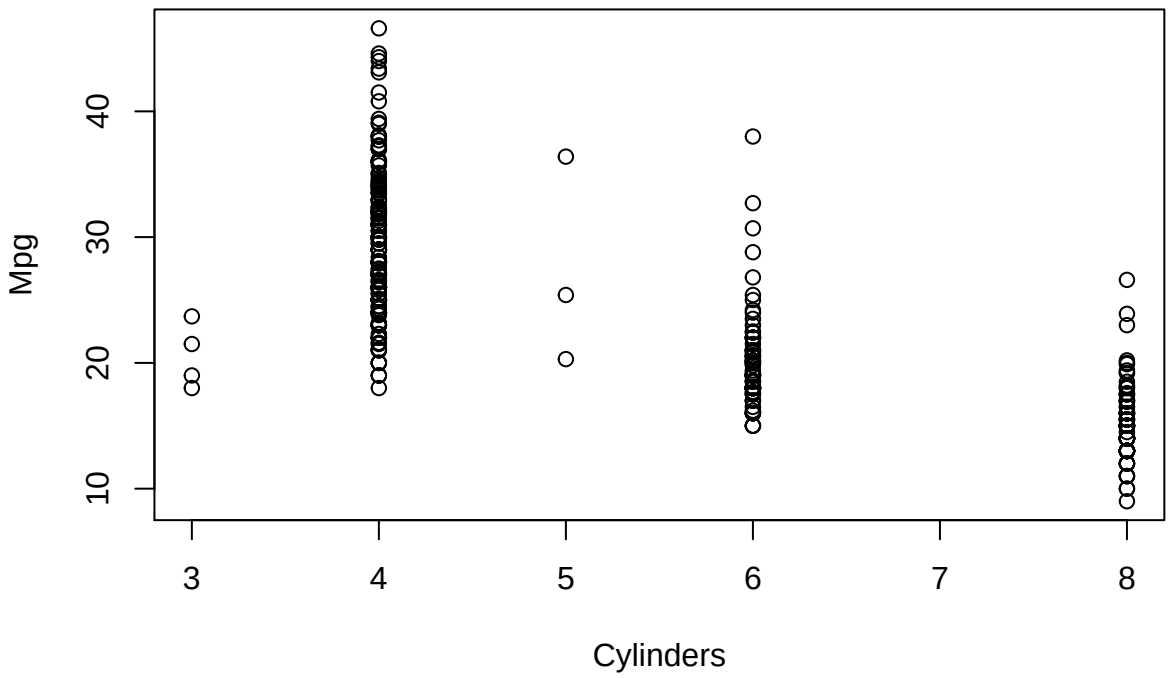
```
## [1] 392   9
```

```
names(auto)
```

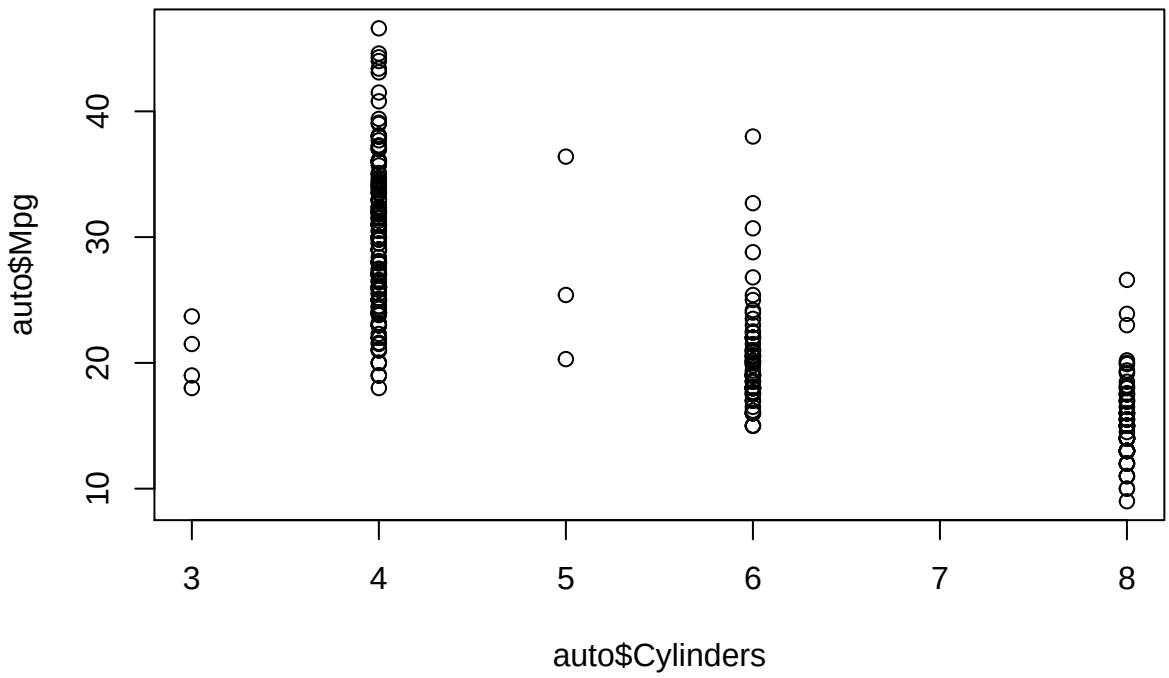
```
## [1] "Mpg"          "Cylinders"    "Displacement" "Horsepower"   "Weight"
## [6] "Acceleration" "Year"         "Origin"       "Name"
```

Lab 1.5 - Additional Graphical and Numerical Summaries

```
attach(auto)
plot(Cylinders,Mpg)
```



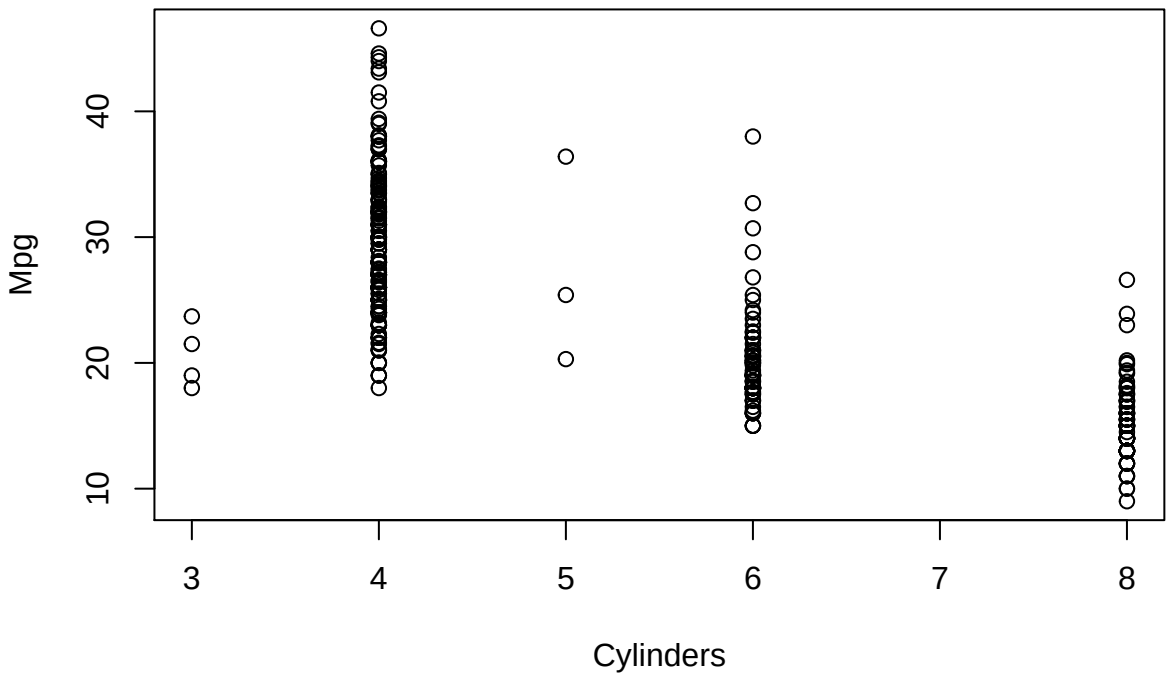

```
plot(auto$Cylinders,auto$Mpg)
```



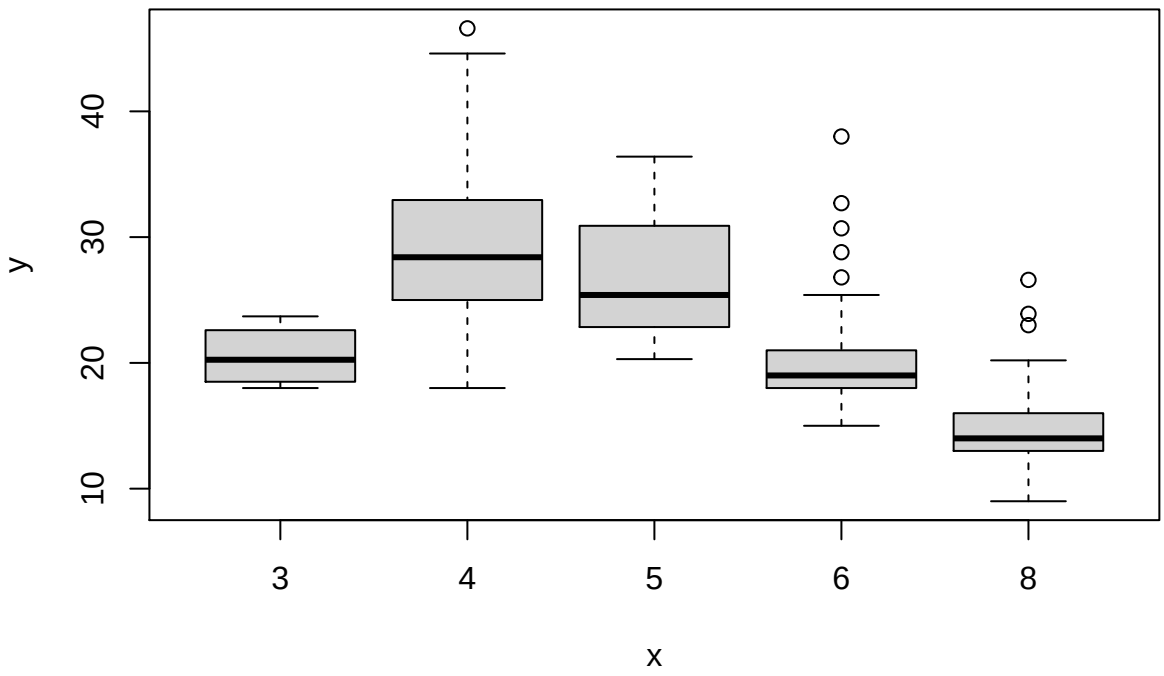

```
attach(auto)
```

```
## The following objects are masked from auto (pos = 3):
##
##     Acceleration, Cylinders, Displacement, Horsepower, Mpg, Name,
##     Origin, Weight, Year
```

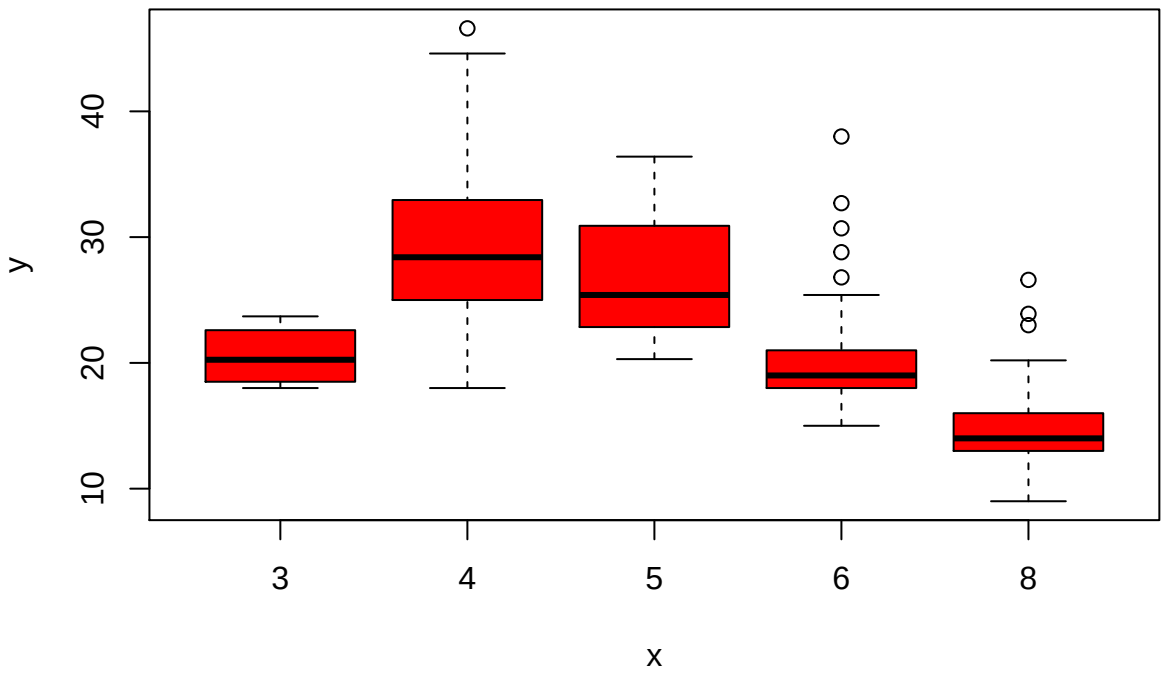
```
plot(Cylinders,Mpg)
```



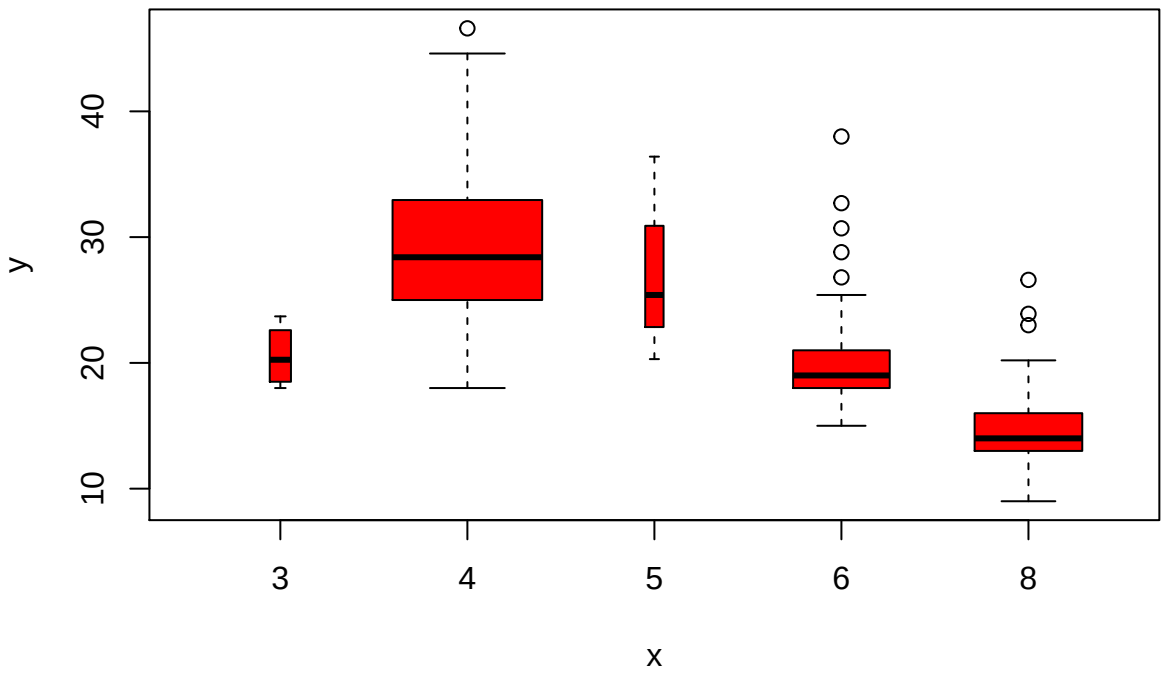

```
Cylinders=as.factor(Cylinders)
plot(Cylinders,Mpg)
```



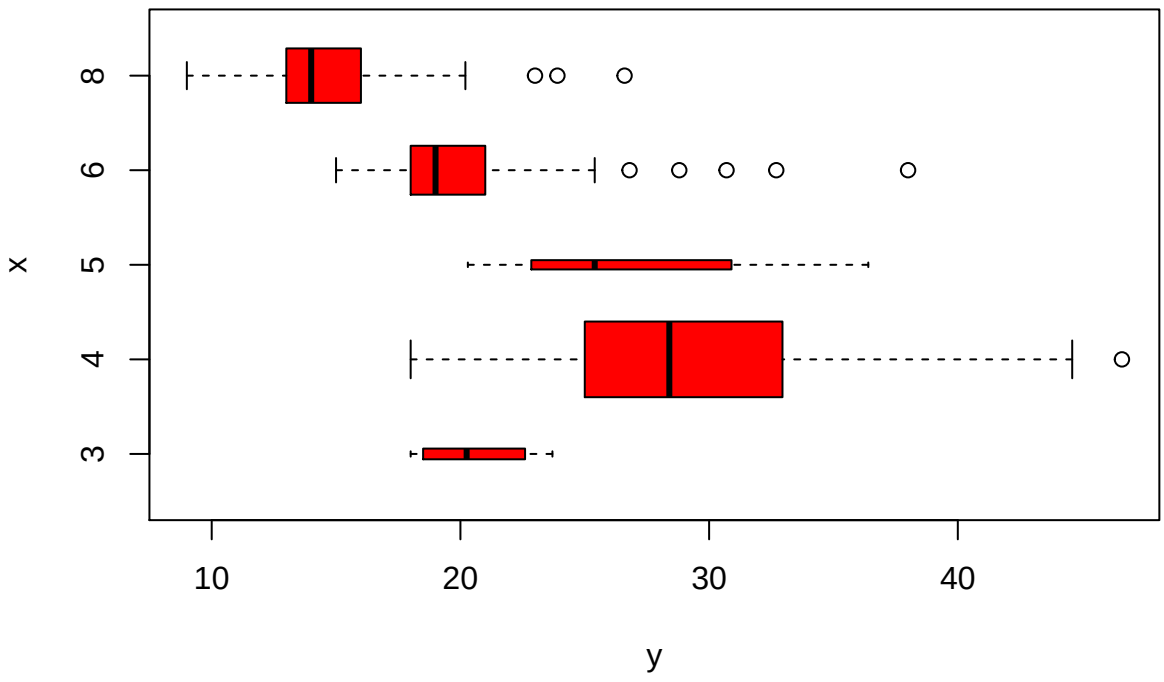

```
plot(Cylinders,Mpg,col="red")
```



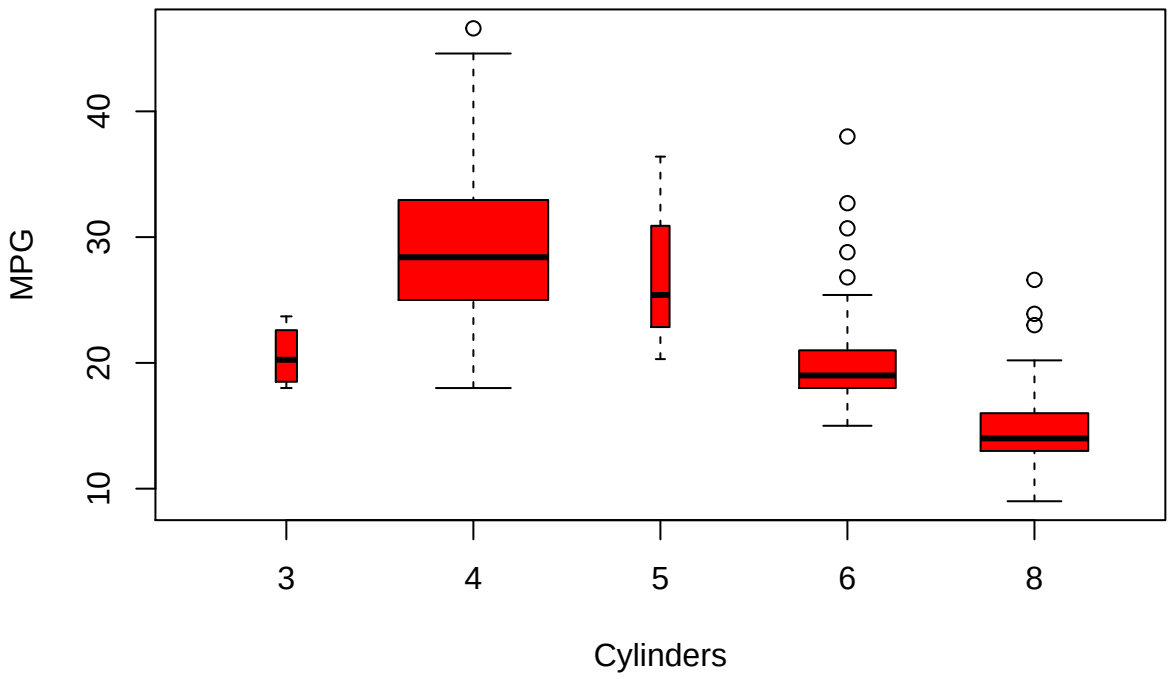

```
plot(Cylinders,Mpg,col="red",varwidth=T)
```



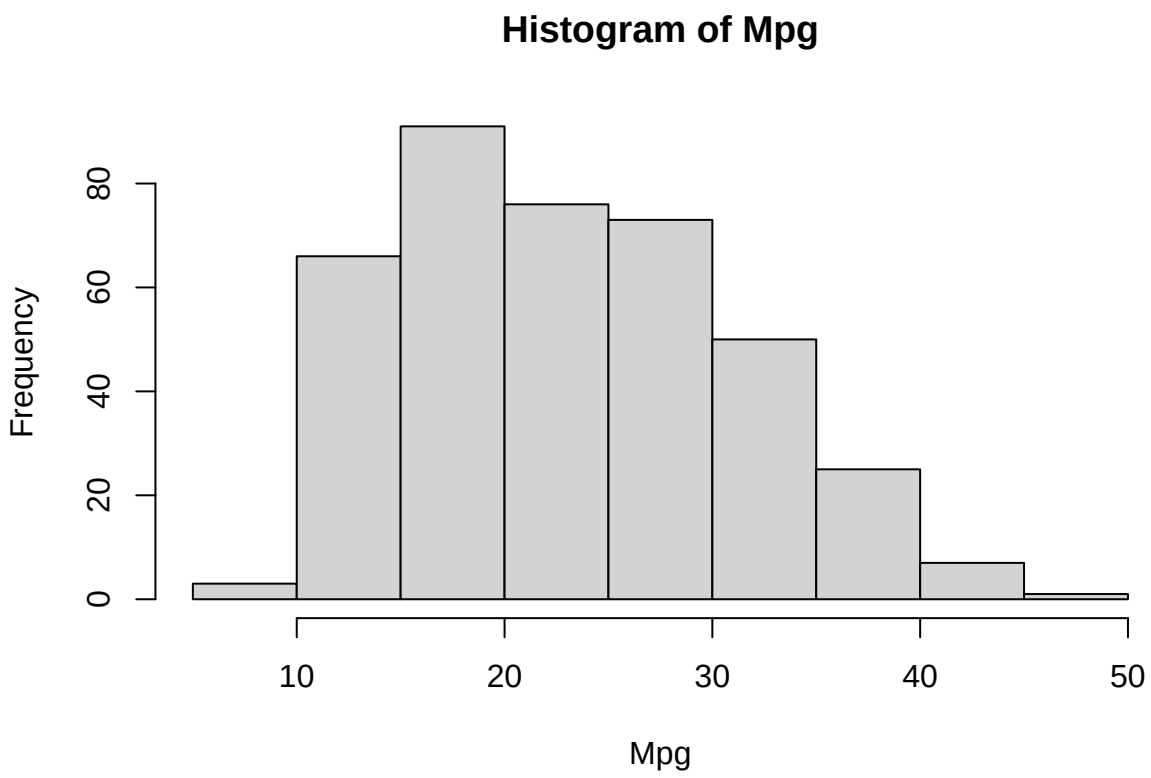

```
plot(Cylinders,Mpg,col="red",varwidth=T,horizontal=T)
```



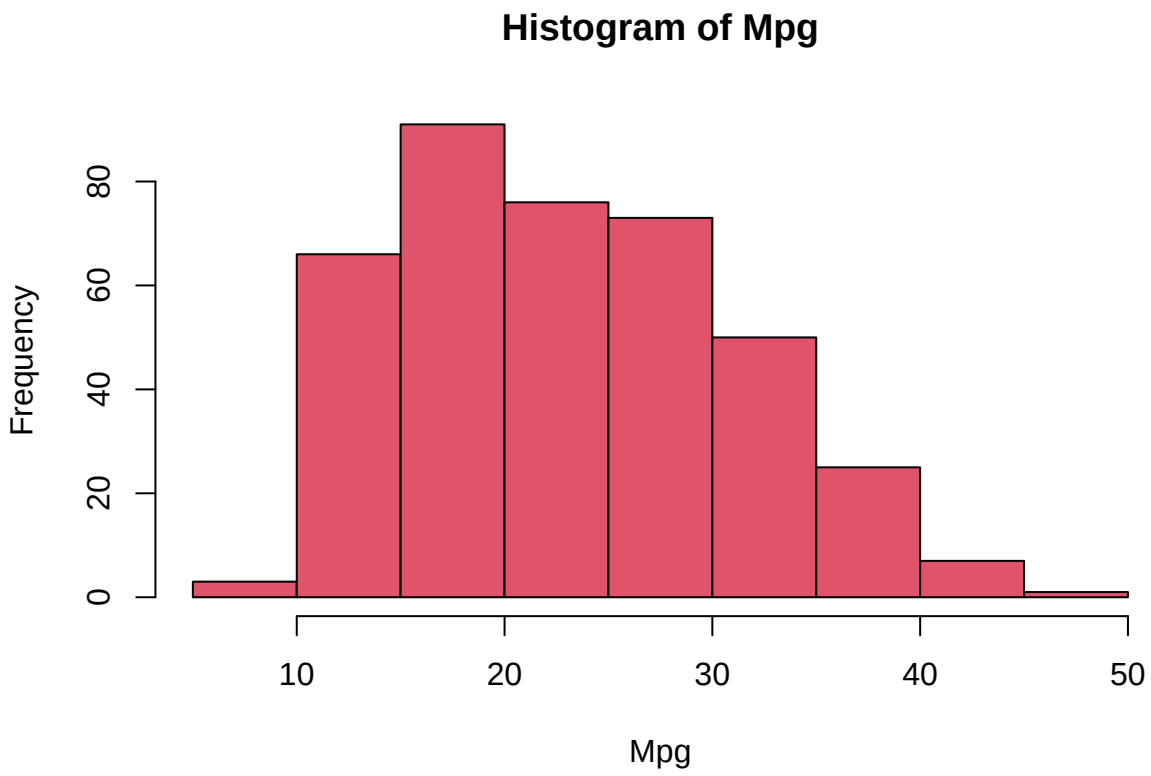

```
plot(Cylinders,Mpg,col="red",varwidth=T,xlab="Cylinders",ylab="MPG")
```



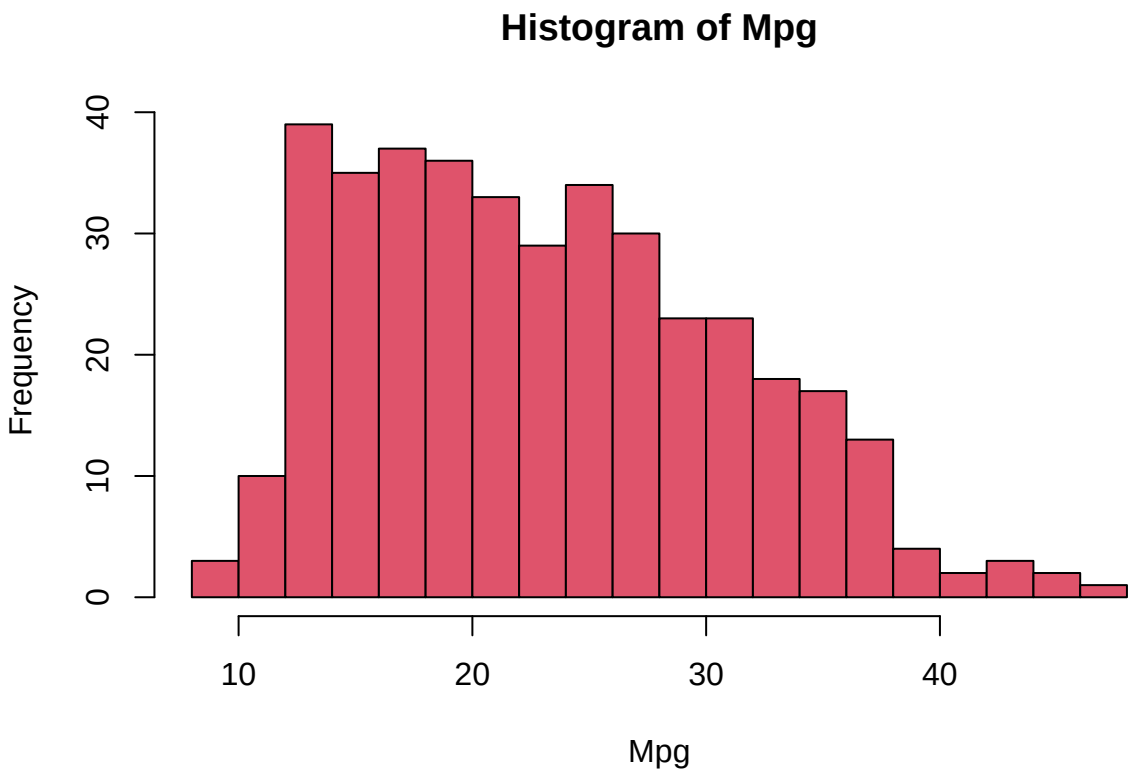

```
hist(Mpg)
```



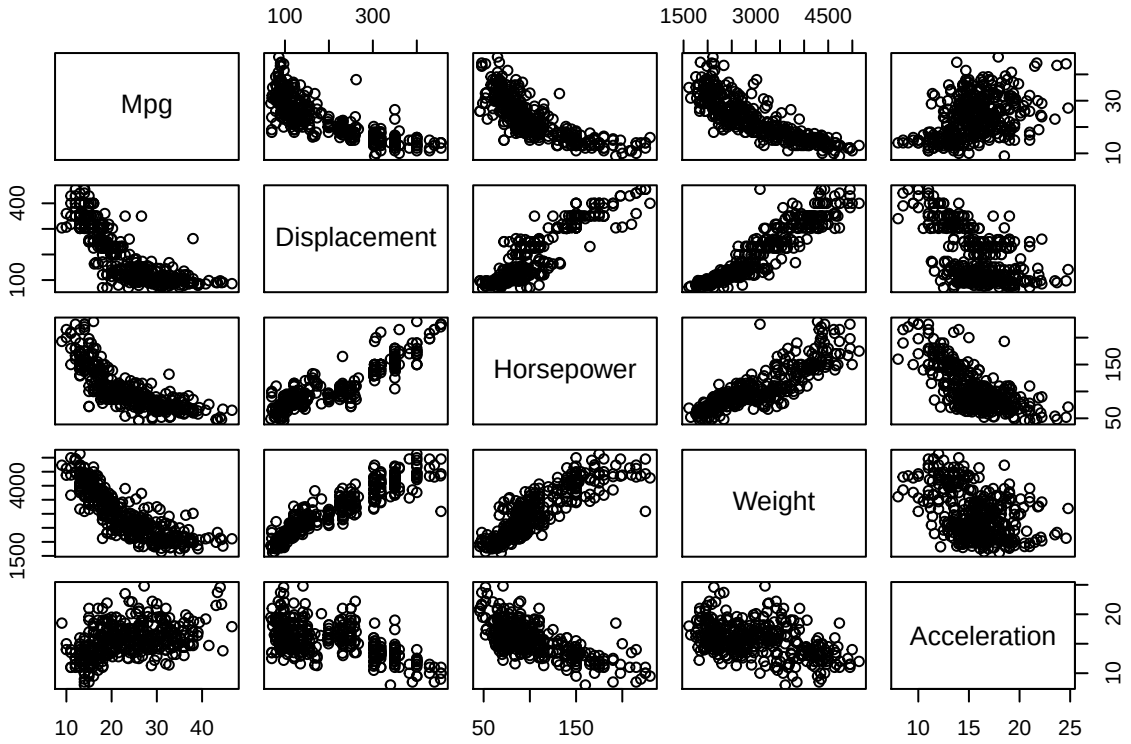

```
hist(Mpg,col=2)
```



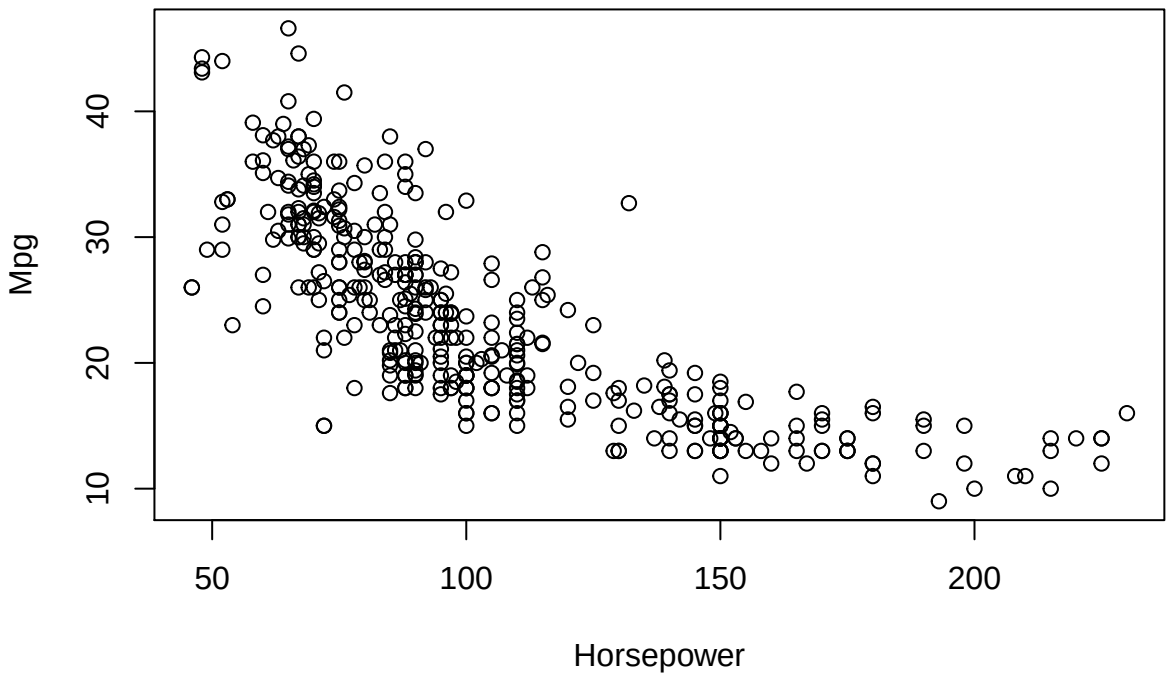

```
hist(Mpg,col=2,breaks=15)
```




```
# pairs(auto)
pairs(~Mpg+Displacement+Horsepower+Weight+Acceleration,auto)
```




```
plot(Horsepower,Mpg)
identify(Horsepower,Mpg,Name)
```




```
## integer(0)
```

```
summary(auto)
```

```
##       Mpg          Cylinders      Displacement     Horsepower        Weight
##  Min.   : 9.00   Min.   :3.000   Min.   : 68.0   Min.   : 46.0   Min.   :1613
##  1st Qu.:17.00   1st Qu.:4.000   1st Qu.:105.0   1st Qu.: 75.0   1st Qu.:2225
##  Median :22.75   Median :4.000   Median :151.0   Median : 93.5   Median :2804
##  Mean   :23.45   Mean   :5.472   Mean   :194.4   Mean   :104.5   Mean   :2978
##  3rd Qu.:29.00   3rd Qu.:8.000   3rd Qu.:275.8   3rd Qu.:126.0   3rd Qu.:3615
##  Max.   :46.60   Max.   :8.000   Max.   :455.0   Max.   :230.0   Max.   :5140
##   Acceleration        Year           Origin          Name
##  Min.   : 8.00   Min.   :70.00   Min.   :1.000   Length:392
##  1st Qu.:13.78   1st Qu.:73.00   1st Qu.:1.000   Class :character
##  Median :15.50   Median :76.00   Median :1.000   Mode  :character
##  Mean   :15.54   Mean   :75.98   Mean   :1.577
##  3rd Qu.:17.02   3rd Qu.:79.00   3rd Qu.:2.000
##  Max.   :24.80   Max.   :82.00   Max.   :3.000
```

```
summary(Mpg)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    9.00   17.00   22.75   23.45   29.00   46.60
```