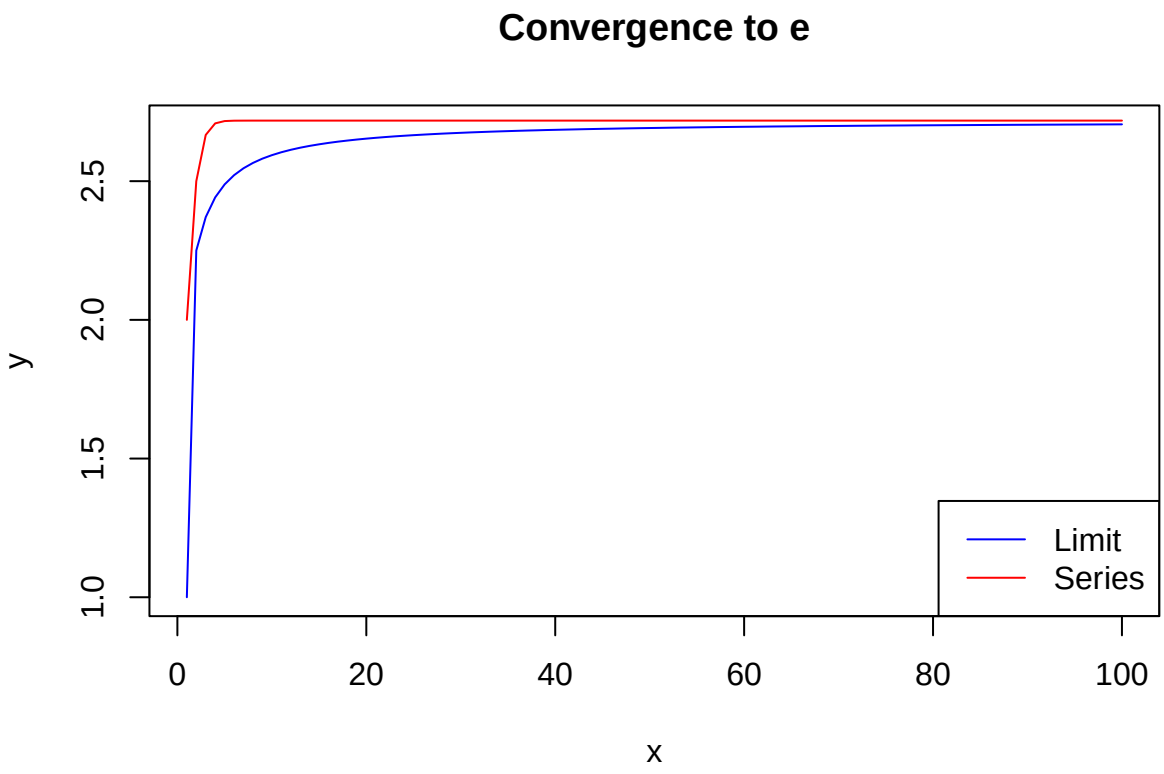
Homework 2

Problem 1

```
x <- 1:100
e_limit <- vector(length = length(x))
e_limit[1] <- 1
e_series <- vector(length = length(x))
e_series[1] <- 2

for(i in 2:100)
{
    e_limit[i] <- (1 + (1/i))^i
    e_series[i] <- (1/factorial(i))+e_series[i-1]
}

plot(x, e_limit[x], col='blue', type='l',
main='Convergence to e', xlab='x', ylab='y')
lines(x, e_series[x], col='red')
legend("bottomright",
  legend = c("Limit", "Series"),
  col = c("blue", "red"),
  lty = c(1,1)
)
```



Problem 2

```
library(nycflights13)
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   3.5.1     v tibble    3.2.1
## v lubridate 1.9.3     v tidyr     1.3.1
## v purrr     1.0.2
## -- 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
```

1.

```
print(flights)
? flights
```

Flights is a dataset containing all the flights that have departed NYC in 2013. It is a tibble with 19 variables, including info on the date of each flight (i.e. year, month, and day), departure time (dep_time), and arrival time (arr_time).

2.

```
count(flights |> filter((carrier == 'AA') & (dep_time < 1030)) |>
select(month, day, dep_time, dest, carrier))
```

```
## # A tibble: 1 x 1
##       n
##   <int>
## 1 11378
```

11,378 flights fit this criteria.

3.

```
sum((flights |> filter(month == 12 & day == 25 & year == 2013))$distance)
```

```
## [1] 803747
```

Across all flights, 803,747 miles were traveled.

4.

```
flights |> filter(month == 12 & day == 25 & year == 2013) |>
mutate(air_time_hour = air_time/60)  |> select(month, day, origin, dest, air_time_hour)
```

```
## # A tibble: 719 x 5
##    month   day origin dest  air_time_hour
##    <int> <int> <chr>  <chr>         <dbl>
##  1    12    25 EWR    CLT            1.63
##  2    12    25 EWR    IAH            3.38
##  3    12    25 JFK    MIA            2.43
##  4    12    25 JFK    BQN            3.18
##  5    12    25 LGA    ORD            2.05
##  6    12    25 LGA    DTW            1.47
##  7    12    25 LGA    ATL            1.97
##  8    12    25 LGA    FLL            2.45
##  9    12    25 EWR    FLL            2.48
## 10    12    25 JFK    MCO            2.28
## # i 709 more rows
```

Problem 3

```
library(datasets)
```

1.

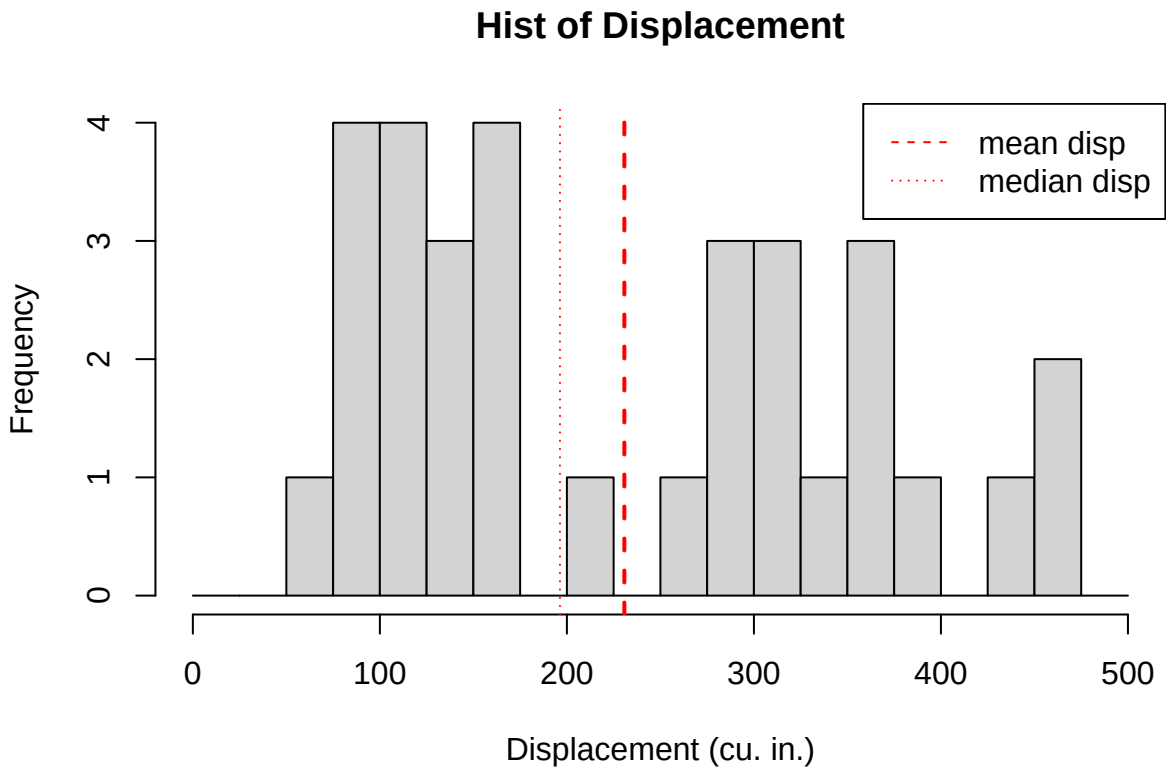
```
print(mtcars)
? mtcars
```

This dataset contains data from the 1974 Motor Trend US magazine on fuel consumption and 10 aspects of automobile design and performane for 32 cars. It is not a tibble. It has 11 variables, including miles per gallon (mpg) and horsepower (hp).

2.

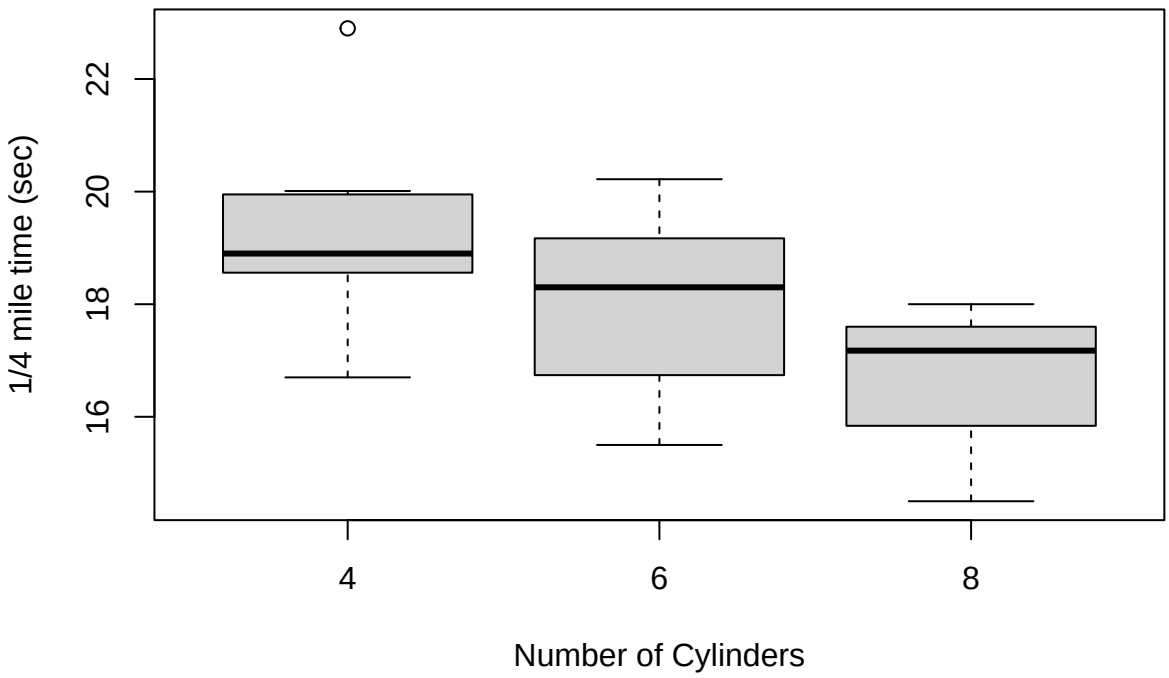
```
hist(mtcars$disp, plot=TRUE, breaks=seq(0,500,25), main="Hist of Displacement", xlab="Displacement (cu.
abline(v=c(mean(mtcars$disp), median(mtcars$disp)), col="red", lty=c(2,3), lwd=c(2,1))
legend("topright",
```

```
  legend = c("mean disp", "median disp"),
  col = c("red", "red"),
  lty = c(2,3),
  lwd(2,1)
)
```



3.

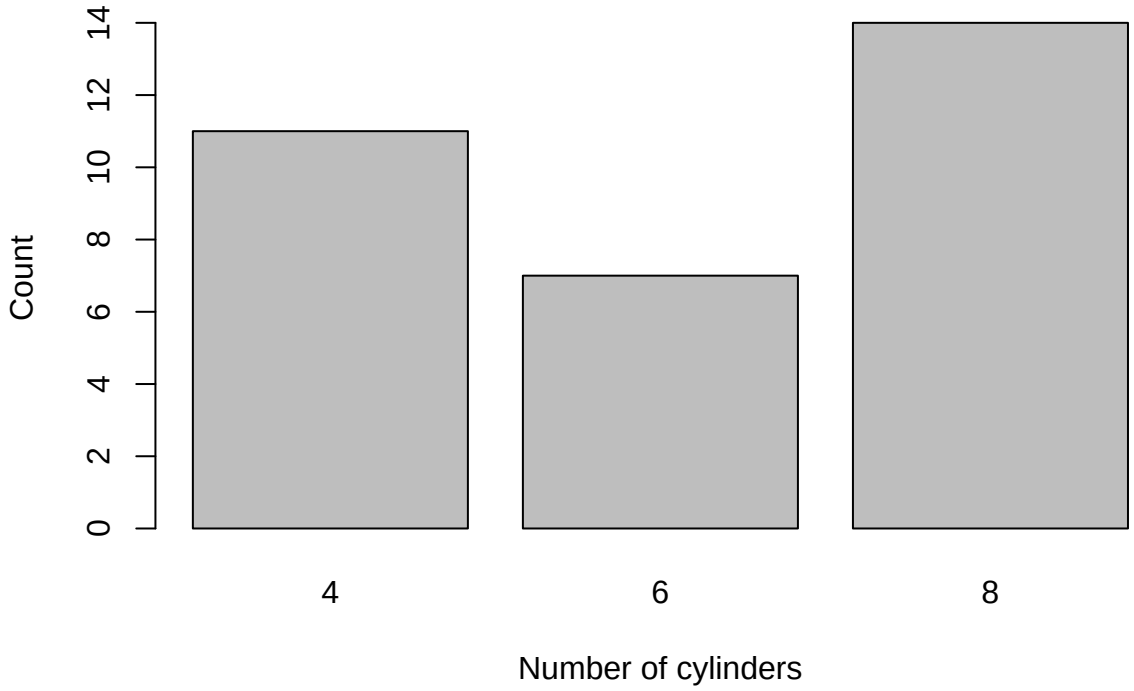
```
boxplot(qsec ~ cyl, data=mtcars, xlab="Number of Cylinders", ylab="1/4 mile time (sec)")
```



The outlier is the Merc 230.

4.

```
barplot(table(mtcars$cyl), xlab="Number of cylinders", ylab = "Count")
```



Problem 4

```
search_insert_position <- function(v, target)
{
    for(i in 1:length(v))
    {
        if(v[i] >= target)
        {
            return(i)
        }
    }
    return(length(v)+1)
}

x <- c(1,3,5,6)
search_insert_position(x, 5)
```

```
## [1] 3
```

```
search_insert_position(x, 2)
```

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

```r
search_insert_position(x, 7)
```

```
## [1] 5
```