Homework 2

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This homework is due on Feb. 5, 2019 at 4:00pm. Please submit as a PDF file on Canvas.

This homework uses the `Cars93` data set. Each observation in the data frame contains information on passenger cars from 1993. This is a big data frame with 27 columns. We are interested in the information on manufacturer (`Manufacturer`), car model (`Model`), type of car (`Type`), car company origin (`Origin`), midrange price in $1000 (`Price`), city MPG (miles per US gallon, `MPG.city`), and fuel tank capacity in gallons (`Fuel.tank.capacity`).

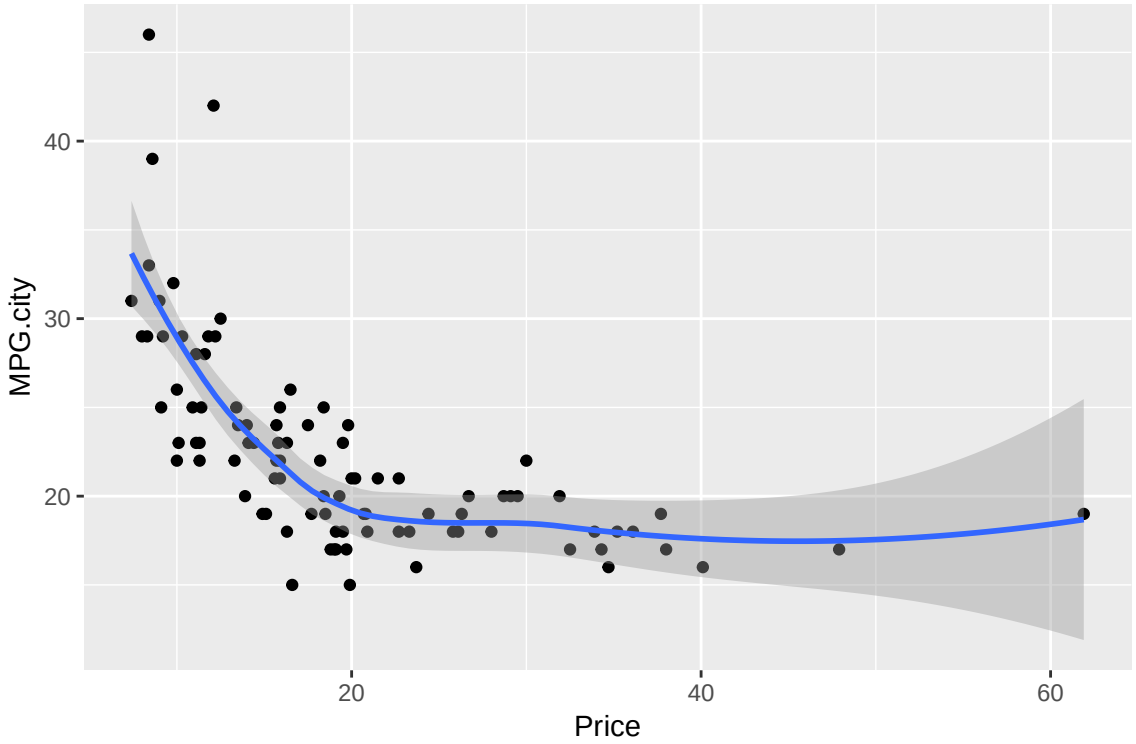
```
Cars93 <- read.csv("http://wilkelab.org/classes/SDS348/data_sets/Cars93.csv")
head(Cars93)
```

```
##   Manufacturer   Model    Type Min.Price Price Max.Price MPG.city
## 1        Acura Integra   Small      12.9  15.9      18.8       25
## 2        Acura  Legend Midsize      29.2  33.9      38.7       18
## 3         Audi      90 Compact      25.9  29.1      32.3       20
## 4         Audi     100 Midsize      30.8  37.7      44.6       19
## 5          BMW    535i Midsize      23.7  30.0      36.2       22
## 6        Buick Century Midsize      14.2  15.7      17.3       22
##   MPG.highway            AirBags DriveTrain Cylinders EngineSize
## 1          31               None      Front         4        1.8
## 2          25 Driver & Passenger      Front         6        3.2
## 3          26        Driver only      Front         6        2.8
## 4          26 Driver & Passenger      Front         6        2.8
## 5          30        Driver only       Rear         4        3.5
## 6          31        Driver only      Front         4        2.2
##   Horsepower  RPM Rev.per.mile Man.trans.avail Fuel.tank.capacity
## 1        140 6300         2890             Yes               13.2
## 2        200 5500         2335             Yes               18.0
## 3        172 5500         2280             Yes               16.9
## 4        172 5500         2535             Yes               21.1
## 5        208 5700         2545             Yes               21.1
## 6        110 5200         2565              No               16.4
##   Passengers Length Wheelbase Width Turn.circle Rear.seat.room
## 1          5    177       102    68          37           26.5
## 2          5    195       115    71          38           30.0
## 3          5    180       102    67          37           28.0
## 4          6    193       106    70          37           31.0
## 5          4    186       109    69          39           27.0
## 6          6    189       105    69          41           28.0
##   Luggage.room Weight  Origin          Make
## 1           11   2705 non-USA Acura Integra
## 2           15   3560 non-USA  Acura Legend
## 3           14   3375 non-USA       Audi 90
## 4           17   3405 non-USA      Audi 100
## 5           13   3640 non-USA      BMW 535i
## 6           16   2880     USA Buick Century
```

Problem 1: (2 pts) Use ggplot2 to create a scatter plot of the city MPG versus the car prices. In the same plot, fit a curve to these data using `geom_smooth()`. In one sentence, what broad trend do you observe in city MPG for different car prices? **HINT**: Plot city MPG on the y-axis and price on the x-axis.

```
ggplot(Cars93,aes(x=Price,y=MPG.city))+geom_point()+geom_smooth()
```

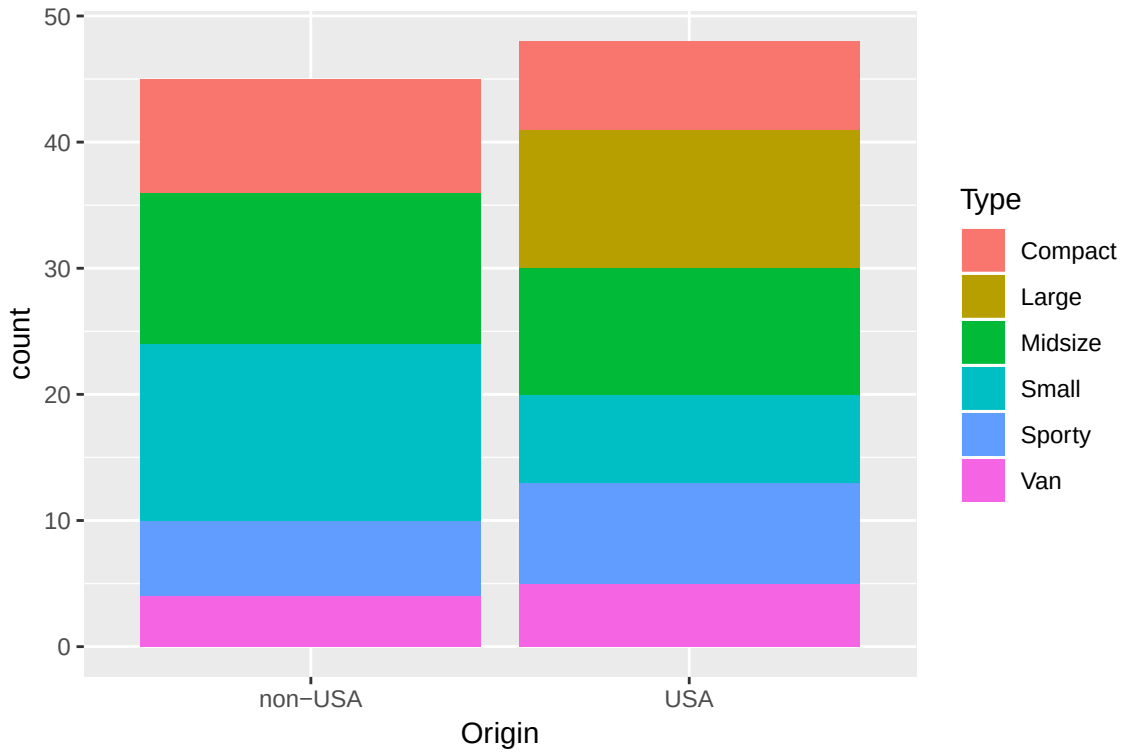
```
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```



City MPG decreases initially and attains a constant value as the prices of consumer cars increase.

Problem 2: (4 pts) Next, create a bar plot that shows the origin of cars, stacked on top of each other, for each car type. Make two observations about the data from this plot. State each in 1 sentence.

```
ggplot(Cars93,aes(x=Origin,fill=Type))+geom_bar()
```

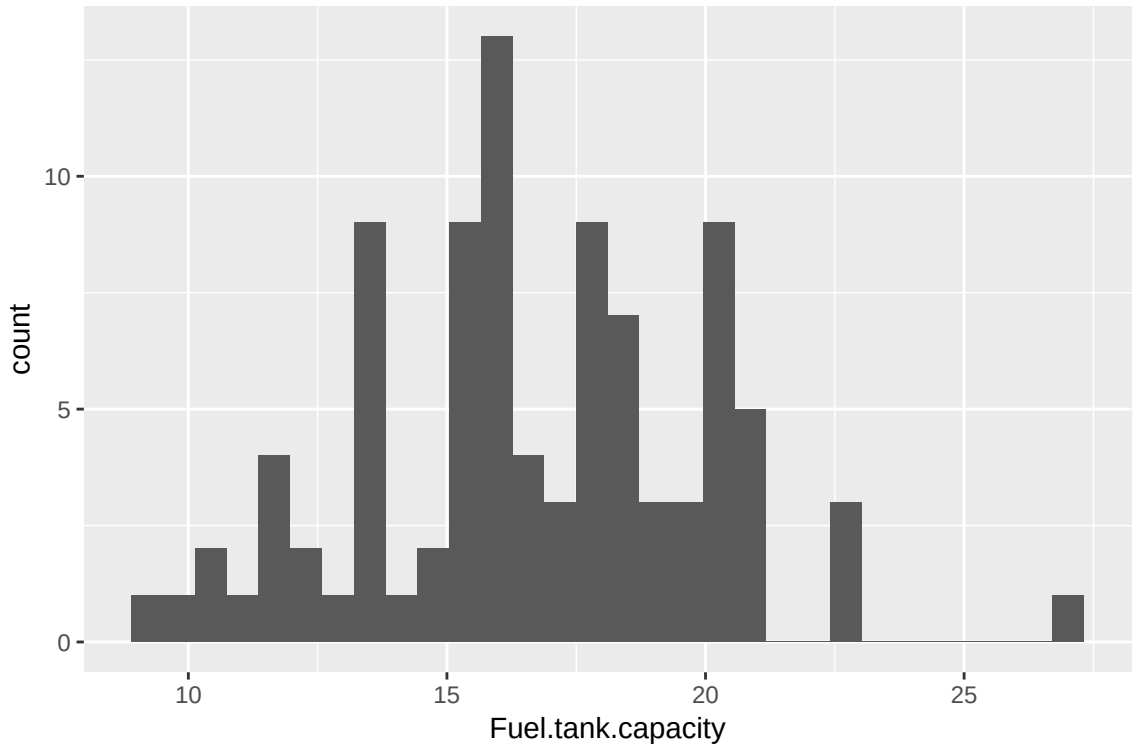


Car Manufacturers of US origin produce mostly bigger cars whereas those from other countries prefer to produce small cars. And number of cars produced by US manufacturers is more than the foreign manufacturers.

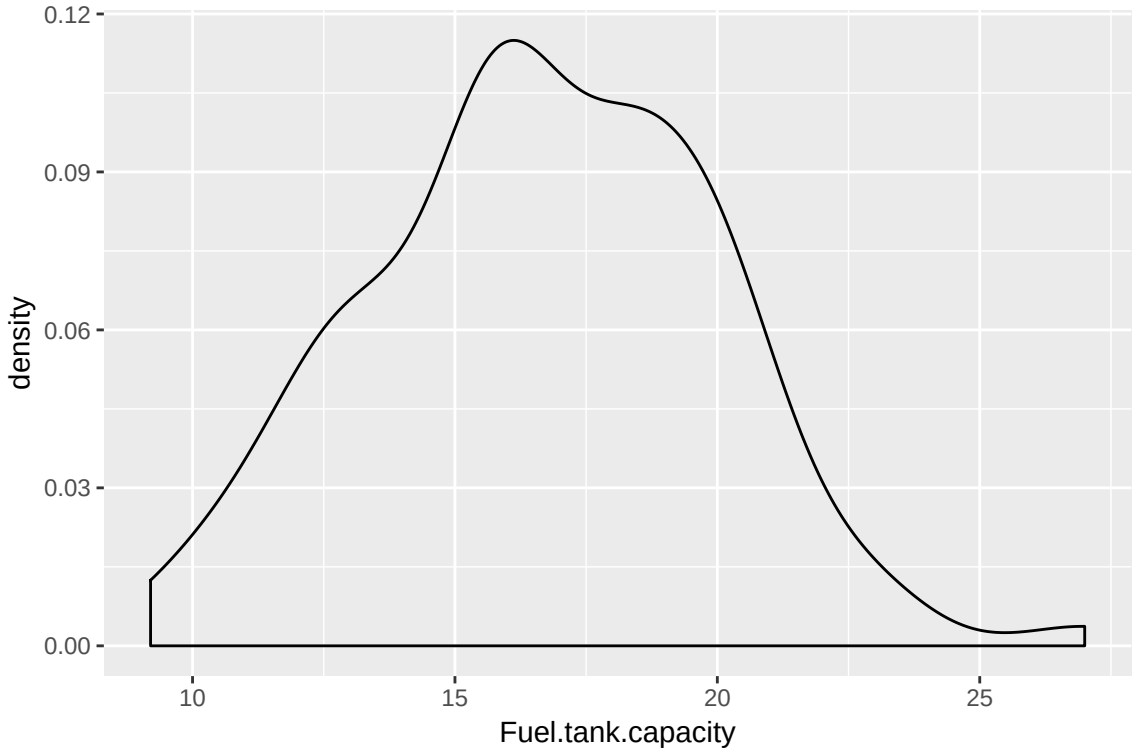
Problem 3: (2 pts) Plot the distribution of fuel tank capacity, once using `geom_histogram()` and once using `geom_density()`.

```
# Histogram
ggplot(Cars93,aes(x=Fuel.tank.capacity))+geom_histogram()
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```




```
# Density
ggplot(Cars93,aes(x=Fuel.tank.capacity))+geom_density()#+geom_vline(aes(xintercept=mean(Fuel.tank.capac
```



Problem 4: (2 pts) What does the y-axis in your histogram represent? In your density plot, what is the *total* area under the curve? For the total area, please give a single number as your answer. **HINT**: You do not need to do any additional calculations to determine the area under the curve. Use Google to find the

answer.

The y-axis in histogram represents how many cars are there within that range(bin) of Fuel tank capacity values. And since the density plot is probability density function, area should be 1.