# HW8

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Question 1 and Question 2

```
DF<-read.csv("/Users/raveena/Desktop/Classroom - R/Marketing Analytics/data/kalepops_data.csv")


summary(DF)
```

```
##       day             price           sales
##  Min.   :   1.0   Min.   :1.230   Min.   :41.00
##  1st Qu.: 274.5   1st Qu.:1.490   1st Qu.:49.00
##  Median : 548.0   Median :1.650   Median :52.00
##  Mean   : 548.0   Mean   :1.598   Mean   :52.44
##  3rd Qu.: 821.5   3rd Qu.:1.730   3rd Qu.:56.00
##  Max.   :1095.0   Max.   :1.810   Max.   :72.00
```

```
range(DF$price)
```

```
## [1] 1.23 1.81
```

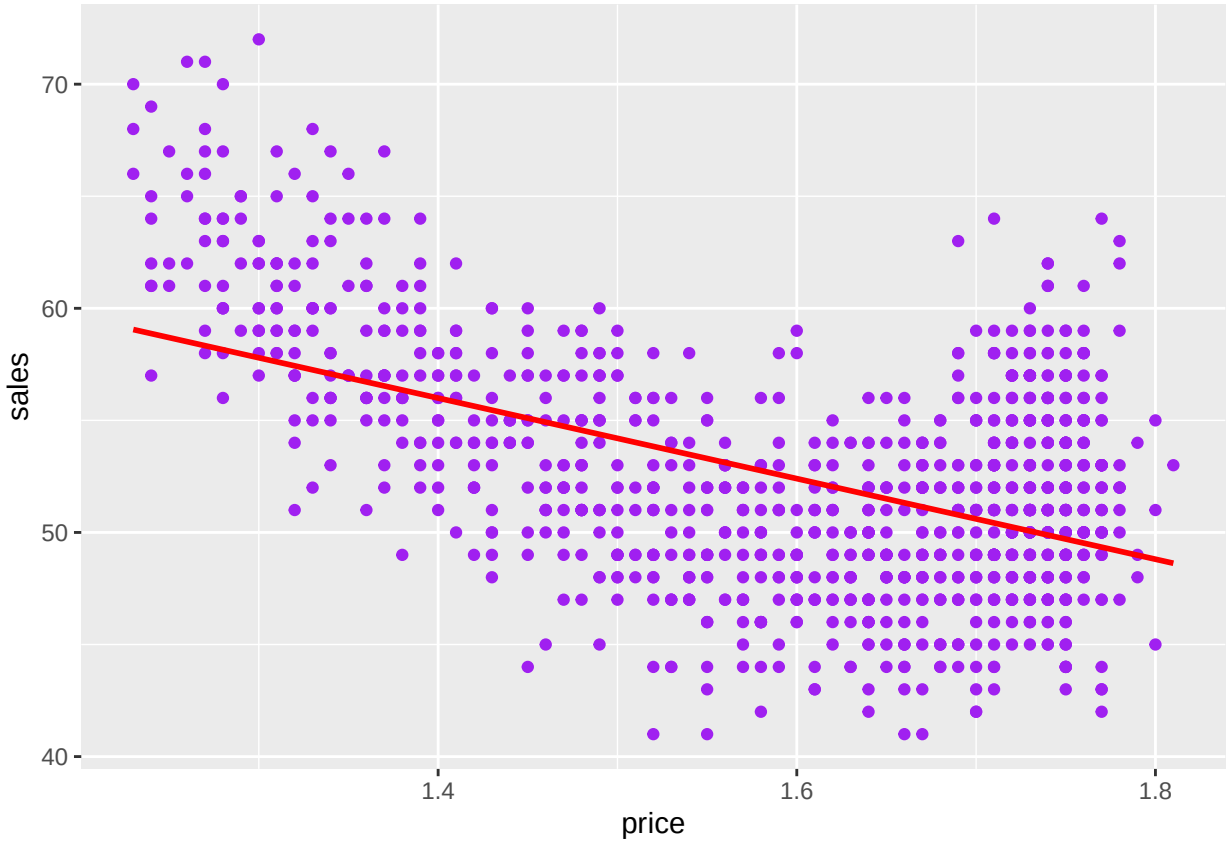
```
range <- max(DF$price) - min(DF$price)
print(range)
```

```
## [1] 0.58
```

Question 3

```
library(ggplot2)

ggplot( data = DF,
        aes( x= price,
             y= sales)) +
  geom_point( color = 'purple') +
  geom_smooth(method = 'lm', se = FALSE, color = 'red')
```

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




Question 4

```
lm1<- lm(log(sales) ~ log(price) + day, data = DF)
summary(lm1)
```

```
##
## Call:
## lm(formula = log(sales) ~ log(price) + day, data = DF)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.197841 -0.041562 -0.001418  0.041366  0.209530
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  4.5976507  0.0167758  274.06   <2e-16 ***
## log(price)  -1.9530985  0.0537912  -36.31   <2e-16 ***
## day          0.0004801  0.0000168   28.58   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.06254 on 1092 degrees of freedom
## Multiple R-squared:  0.5858, Adjusted R-squared:  0.585
## F-statistic: 772.1 on 2 and 1092 DF,  p-value: < 2.2e-16
```

```r
coef(lm1)["log(price)"]
```

```
## log(price)
##  -1.953099
```

Question 5

```r
coefficient_price <- coef(lm1)["log(price)"]

delta_p <- 0.02
delta_q <- (coefficient_price * delta_p)*100

print(delta_q)
```

```
## log(price)
##  -3.906197
```

Q7 and Q8

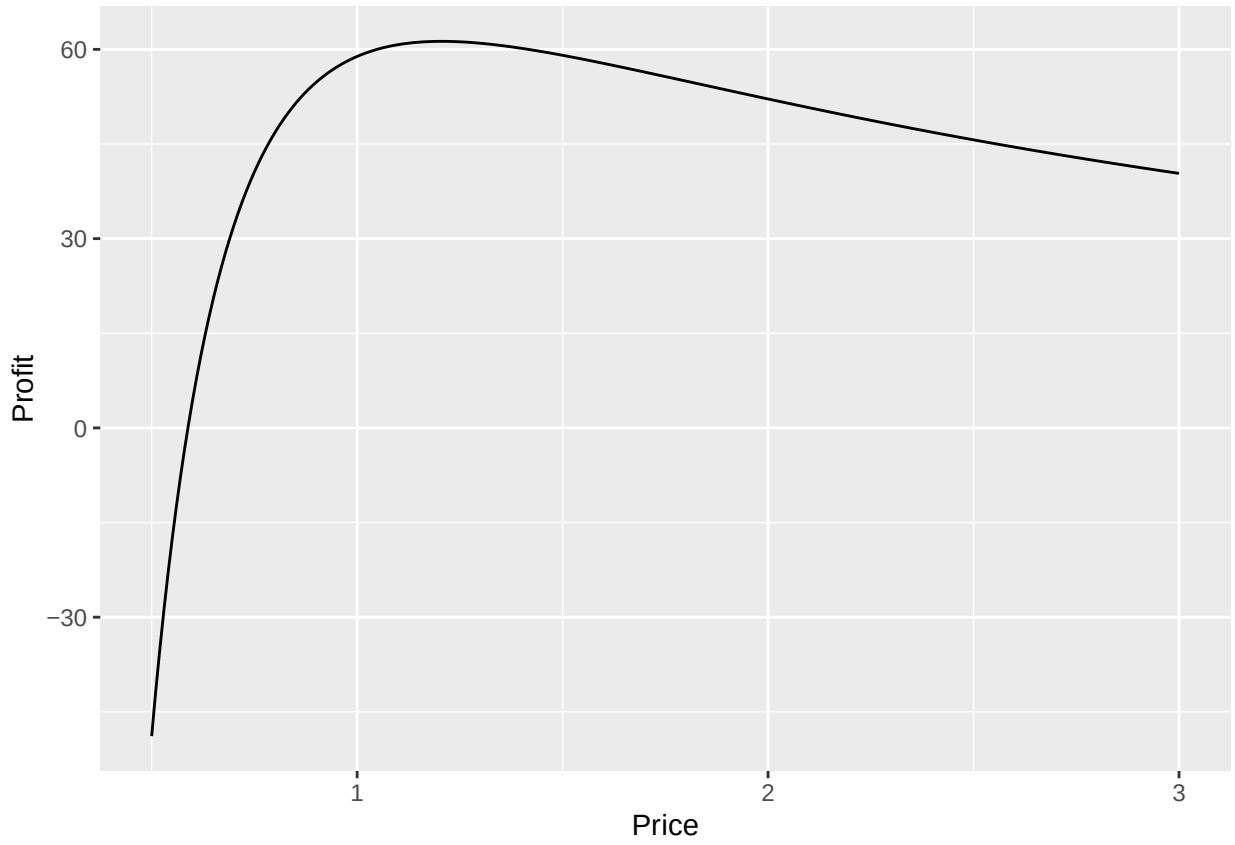
```r
kale_profit <- function(price, day, lm1, retail_margin, marginal_cost) {
logQ <- predict(lm1, newdata = data.frame(day = day, price = price))
Q <- exp(logQ + sigma(lm1) ^ 2/2)
revenue <- Q * price * (1 - retail_margin)
cost <- Q * marginal_cost
profit <- revenue - cost
return(list(Q = Q, profit = profit))
}

price <- 1.5
day <- 1095
retail_margin <- 0.15
marginal_cost <- 0.5

profit_result <- kale_profit(price, day, lm1, retail_margin, marginal_cost)
profit_result
```

```
## $Q
##        1
## 76.20229
##
## $profit
##        1
## 59.05677
```

Q9 and Q10

```r
library(ggplot2)



results <- data.frame( prices = seq(from = .5,
```

```
                to = 3,
                by = .01))


results$pft <- rep(0, times = nrow(results))

for (i in 1:nrow(results)) {
  results$pft[i] <- kale_profit(price = results$prices[i],
                     day = 1095,
                     lm1 = lm1,
                     retail_margin = retail_margin,
                     marginal_cost = marginal_cost)$profit
}




retail_margin <- 0.15
marginal_cost <- 0.5



plot_data <- data.frame(price = results$prices, profit = results$pft)

ggplot(plot_data, aes(x = price, y = profit)) +
geom_line() +
labs(x = "Price", y = "Profit")
```




```
optimal_price <- price[which.max(results$pft)]


maxpft_index <- which.max(results$pft)
max_profit <- results$pft[maxpft_index]
max_profit
```

```
## [1] 61.2701
```