QUESTION 3

i) response with other predictors

```
> lm.fit<-lm(mpg~cylinders+displacement+acceleration+weight+year+origin,data=ISLAs1)
> summary(lm.fit)

Call:
lm(formula = mpg ~ cylinders + displacement + acceleration +
    weight + year + origin, data = ISLAs1)

Residuals:
    Min      1Q  Median      3Q     Max
-9.5640 -2.1692 -0.0382  1.8196 13.0720

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  -1.974e+01  4.168e+00  -4.737 3.06e-06 ***
cylinders    -4.447e-01  3.211e-01  -1.385   0.1668
displacement  1.719e-02  7.189e-03   2.390   0.0173 *
acceleration  1.557e-01  7.777e-02   2.002   0.0460 *
weight       -6.838e-03  5.812e-04 -11.767  < 2e-16 ***
year          7.647e-01  4.973e-02  15.378  < 2e-16 ***
origin        1.346e+00  2.706e-01   4.975 9.87e-07 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.33 on 385 degrees of freedom
Multiple R-squared:  0.8208,    Adjusted R-squared:  0.818
F-statistic: 293.9 on 6 and 385 DF,  p-value: < 2.2e-16
```

ii) summary report

```
> lm.fit<-lm(mpg~cylinders+displacement+acceleration+weight+year+origin,data=ISLAs1)
> summary(lm.fit)

Call:
lm(formula = mpg ~ cylinders + displacement + acceleration +
    weight + year + origin, data = ISLAs1)

Residuals:
    Min      1Q  Median      3Q     Max
-9.5640 -2.1692 -0.0382  1.8196 13.0720

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  -1.974e+01  4.168e+00  -4.737 3.06e-06 ***
cylinders    -4.447e-01  3.211e-01  -1.385   0.1668
displacement  1.719e-02  7.189e-03   2.390   0.0173 *
acceleration  1.557e-01  7.777e-02   2.002   0.0460 *
weight       -6.838e-03  5.812e-04 -11.767  < 2e-16 ***
year          7.647e-01  4.973e-02  15.378  < 2e-16 ***
origin        1.346e+00  2.706e-01   4.975 9.87e-07 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.33 on 385 degrees of freedom
Multiple R-squared:  0.8208,    Adjusted R-squared:  0.818
F-statistic: 293.9 on 6 and 385 DF,  p-value: < 2.2e-16
```

iii) Cylinders has no significant code , hence it has no influence on mpg

iv) rerun without cylinders

```
> lm.fit<-lm(mpg~displacement+acceleration+weight+year+origin,data=ISLAs1)
> summary(lm.fit)

Call:
lm(formula = mpg ~ displacement + acceleration + weight + year +
    origin, data = ISLAs1)

Residuals:
    Min      1Q  Median      3Q     Max
-9.3110 -2.1671 -0.0526  1.8293 13.0061

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  -2.054e+01  4.133e+00  -4.970 1.01e-06 ***
displacement  1.060e-02  5.398e-03   1.963   0.0503 .
acceleration  1.522e-01  7.782e-02   1.956   0.0512 .
weight       -6.904e-03  5.799e-04 -11.904  < 2e-16 ***
year          7.639e-01  4.978e-02  15.344  < 2e-16 ***
origin        1.319e+00  2.702e-01   4.881 1.55e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.334 on 386 degrees of freedom
Multiple R-squared:  0.8199,    Adjusted R-squared:  0.8175
F-statistic: 351.4 on 5 and 386 DF,  p-value: < 2.2e-16
```

P value is same in both cases , R squared is also decreasing as cylinders is deleted.

v) Consider all predictors and run

```
> lm.fit<-lm(mpg~horsepower+cylinders+displacement+acceleration+weight+year+origin,data=ISLAs1)
> summary(lm.fit)

Call:
lm(formula = mpg ~ horsepower + cylinders + displacement + acceleration +
    weight + year + origin, data = ISLAs1)

Residuals:
    Min      1Q  Median      3Q     Max
-9.5903 -2.1565 -0.1169  1.8690 13.0604

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  -17.218435   4.644294  -3.707  0.00024 ***
horsepower    -0.016951   0.013787  -1.230  0.21963
cylinders     -0.493376   0.323282  -1.526  0.12780
displacement   0.019896   0.007515   2.647  0.00844 **
acceleration   0.080576   0.098845   0.815  0.41548
weight        -0.006474   0.000652  -9.929  < 2e-16 ***
year           0.750773   0.050973  14.729  < 2e-16 ***
origin         1.426141   0.278136   5.127 4.67e-07 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.328 on 384 degrees of freedom
Multiple R-squared:  0.8215,    Adjusted R-squared:  0.8182
F-statistic: 252.4 on 7 and 384 DF,  p-value: < 2.2e-16
```

Coefficient of year is the maximum positive value from all other coefficients and the plot shows that mgp values are been increasing for the recent cars than the older once.

By the addition of the other predicates there is an increase in the multiple R squared value and the adjusted R square value.

By seeing the significance code from the above screenshot we can say that horsepower, cylinders and acceleration have no significance on mpg.