Question 8

a) The full summary is as follows:

```
Call:
lm(formula = mpg ~ horsepower, data = Auto)

Residuals:
     Min       1Q   Median       3Q      Max
-13.5710  -3.2592  -0.3435   2.7630  16.9240

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 39.935861   0.717499   55.66   <2e-16 ***
horsepower  -0.157845   0.006446  -24.49   <2e-16 ***
---
Signif. codes:
0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 4.906 on 390 degrees of freedom
Multiple R-squared:  0.6059,    Adjusted R-squared:  0.6049
F-statistic: 599.7 on 1 and 390 DF,  p-value: < 2.2e-16
```

I)
Yes, there is a relationship between the response and the predictor, as we have 2 non-zero coefficients (B0 = 39.935 and B1 = -.0158), each of which are significant at a level of p-value = essentially 0 (as shown by the coefficients section of the table)

ii) The relationship is fairly strong between the response and the predictor, as we have an R^2 value of .6059. This is not super strong, but is strong enough to suggest a relationship, as around 60% of the variation in mpg can be accounted for by the change in horsepower

iii) The relationship is a negative relationship between mpg and horsepower, since the B1 coefficient is negative. As horsepower goes up, mpg goes down.

Other requests)
I extracted the coefficients as such:

```
coeffs = summary(model)$coefficients

B0 = coeffs["(Intercept)", "Estimate"]
B1 = coeffs["horsepower", "Estimate"]
```

RSE: 4.906

```
> print(sigma(model))
[1] 4.905757
```

95% confidence intervals:
RSE for B0: .717
RSE for B1: .006

```
Coefficients:
             Estimate Std. Error
(Intercept) 39.935861   0.717499
horsepower  -0.157845   0.006446
```

B0:
[38.5, 41.37]

```
[1] "B0 Confidence interval: ---"
[1] "[B0 - 2 * RSEB0, B0 + 2 * RSEB0]"
[1] 38.50086
[1] 41.37086
```

B1:
[-.17, -.145]

```
[1] "B1 Confidence interval: ---"
[1] "[B1 - 2 * RSEB1, B1 + 2 * RSEB1]"
[1] -0.1707357
[1] -0.1449537
```