Qus 1.

a) It is appropriately modeled because hours of unpaid work per week have a negative linear relation with job satisfaction and income has a positive linear relation with job satisfaction.

b) At a 95% confidence level, our p-value = 0.001683 is less than alpha = 0.05. Thus, we can reject the null hypothesis, thus our model is statistically significant. Therefore, the data is appropriately modelled using a linear model.

c) Coefficient estimates:

Intercept	4.799258
Hours of unpaid work per week	-0.381847
Age	0.004556
Income	0.023250

Statistically significant variables at a 95% confidence level:

Hours of unpaid work per week	p-value = 0.006903
Income	p-value = 0.006013

Qus 2.

a) Correlation coefficients

cor(data$PIQ, data$Height)

[1] -0.09315559

cor(data$PIQ, data$Weight)

[1] 0.002512154

If we ran an F-statistic test on model PIQ = Brain (R-squared = 0.1427), and then on a second model PIQ = Brain + Weight (R-squared = 0.1925), our coefficient of determination does not change drastically when weight is included in the model and weight has little to no correlation with PIQ. Thus, we can conclude that we do not want to include weight in our model.

If we ran an F-statistic test on model PIQ = Brain (R-squared = 0.1427), and then on a second model PIQ = Brain + Height (R-squared = 0.2949). More of the variation in performance IQ is explained by Brain and Height. Also, height has a disputable negative correlation with PIQ. Thus, we can conclude that we do want to include height in our model.

b) Coefficients:

(Intercept)	Brain	Height
111.276	2.061	-2.730

If there was no effect on PIQ by Height (i.e. Height = 0), then a 2.061 unit increase in brain size would result in a 1 unit increase in PIQ

If there was no effect on PIQ by Brain (i.e. Brain = 0), then a 2.730 unit increase in height would result in a 1 unit decrease in PIQ

Qus 3.

a) At a 95% confidence level, our p-value < 2.2e-16 which is less than alpha = 0.05. Thus, we can reject the null hypothesis, thus our model is statistically significant.

Pr(>F)

sqft < 2.2e-16 ***

dist 0.0007144 ***

age 7.102e-06 ***, since all p-values are less than alpha = 0.05. Thus, we can reject the null hypothesis, thus our independent variables are all statistically significant.

b) At a 95% confidence level, our p-value < 2.2e-16 which is less than alpha = 0.05. Thus, we can reject the null hypothesis, thus our model is statistically significant.

Pr(>F)

sqft < 2.2e-16 ***

age 5.483e-08 ***, since all p-values are less than alpha = 0.05. Thus we can reject the null hypothesis, thus our independent variables are all statistically significant.

c) F-statistic = 0.02196043

Null hypothesis: There is no difference between the two models.

Alternative hypothesis: At least one of the models is a better fit for the data.

At a 95% confidence level, our p-value = 0.8813 is greater than alpha = 0.05, hence we fail to reject the null hypothesis. We can conclude that there is no significant difference between the two models.

Qus 4. a)

Civic is model reference variable

```
lm(formula = Price ~ Model, data = data)

Coefficients:
 (Intercept)  ModelCorolla
    14735.8        -550.5
```

There is a $550.5 decrease in the sale price of the car if the model is a Corolla.

b)

Black is color reference variable

```
lm(formula = Price ~ Color, data = data)

Coefficients:
(Intercept)    ColorBlue   ColorOther    ColorRed  ColorSilver
   14759.5       -363.6       -852.2       -515.6       -163.8
 ColorWhite
    -250.8
```

There is a $363.6 decrease in the sale price of the car if the color of the car is Blue.

There is a $515.6 decrease in the sale price of the car if the color of the car is Red.

There is a $163.8 decrease in the sale price of the car if the color of the car is Silver.

There is a $250.8 decrease in the sale price of the car if the color of the car is White.

There is a $852.2 decrease in the sale price of the car if the color of the car is Other.

c)

```
lm(formula = Price ~ Model + Odometer + Color, data = data)

Coefficients:
 (Intercept)  ModelCorolla     Odometer    ColorBlue   ColorOther
      17550        -558.1       -0.08677       74.15       -44.64
   ColorRed   ColorSilver   ColorWhite
      90.17         366.8        186.6
```

There is a $558.1 decrease in the sale price of the car if the model is a Corolla, and the odometer and color are both 0.

There is a $0.09 decrease in the sale price of the car if the odometer increases by 1 unit, and the model and color are both 0.

There is a $74.15 increase in the sale price of the car if the color is Blue, and the odometer and model are both 0.

There is a $90.17 increase in the sale price of the car if the color is Red, and the odometer and model are both 0.

There is a $366.8 increase in the sale price of the car if the color is Silver, and the odometer and model are both 0.

There is a $186.6 increase in the sale price of the car if the color is White, and the odometer and model are both 0.