NAMES:

lm() uses the closed form equations to find the least squares estimates but there are other ways to do this optimization; one was discussed in the notes. We will have you go through this method here, comparing to the linear model you made in the problem set. Load the flights data into your R session.

The function rss below is meant to mirror the formula for RSS for a simple linear regression model:

$$\text{RSS } (b_0, b_1) = \sum_{i=1}^n \left(y_i - (b_0 + b_1 x_i) \right)^2$$

rss <- function(coef) {
 sum((flights\$avg_speed - (coef[1] + coef[2] * flights\$distance))^2)
}</pre>

coef[1] and coef[2] represent b_0 and b_1 , respectively and refer to the first two elements of a vector called coef which is the argument of the function.

- 1. Use the optim() template given to find the slope b_0 and intercept b_1 that minimizes the RSS function. You can do this by using the table below. In this table, we have given you two different sets of starting values for b_0 and b_1 to try:
 - $b_0 = 0, b_1 = 0$
 - Eyeball the slope and intercept from the scatterplot with the line superimposed on the data (from the problem set).

Write in your final values in each case in the spaces given. Comment on whether they match the results you got from your linear model object in the problem set.

optim(par = c(,), fn =)

| Starting b_0 | Starting b_1 | Final b_0 | Final b_1 |
|------------------------------|--------------------------|-------------|-------------|
| 0 | 0 | | |
| Eyeballed <i>intercept</i> : | Eyeballed <i>slope</i> : | | |

2. Change the rss function from the last question so it captures the sum of the *absolute value of the resid-uals*. This is given by the function below.

$$\text{RSABS } (b_0,b_1) = \sum_{i=1}^n \lvert y_i - (b_0 + b_1 x_i) \rvert$$

Call this new function you make rsabs. You can fill in the template below.

rsabs <- function(coef) {</pre>

3. Use rsabs to estimate the parameters b_0 and b_1 using optim() as you did before for rss. Comment on whether your results matches the estimates that come out of lm() and from the rss function.

| Starting b_0 | Starting b_1 | Final b_0 | Final b_1 |
|------------------------------|--------------------------|-------------|-------------|
| 0 | 0 | | |
| Eyeballed <i>intercept</i> : | Eyeballed <i>slope</i> : | | |