1. Indicate whether or not the following statements are correct and justify your answer in one or two sentences.

(a) The p-value from a t-test of a regression coefficient reflects the probability that the true effect of the respective variable is zero.

(b) You run a regression with two covariates. The p-values from the t-tests of the regression coefficients are .1 for $\beta_1$ and .05 for $\beta_2$. Compared to $\beta_1$, it is twice as likely that $\beta_2$ has a substantial true effect.

(c) If we calculate 100 90%-confidence intervals for a regression coefficient in repeated sampling, we expect 90 of them to include the true parameter.

(d) If the F-test that all regression coefficients are jointly zero is significant, this indicates that the regression model is unlikely to be mis-specified.

(e) One advantage of the F-test is that it is very flexible. For example, if we model $y = \beta_0 + \beta_1 x + \beta_2 z + \epsilon$ and test the null hypothesis $\beta_0 = \beta_1 = \beta_2 = 0$, then we can compare the p-values even across two different samples.

2. We use our favourite dataset on campaign spending. As last week, regress first preference votes on total spending and incumbency.

(a) Do the following “manually” in R:

   Calculate the t-statistic of the incumbency coefficient (the one you find when summarizing the estimated model) and check this test statistic against the critical value for $t$ with $\alpha = 1\%$. Interpret the result very briefly (two to three sentences).

   Hints: To calculate the t-statistic, you may use results stored in `reg$coeff` and `vcov(reg)`. Also note that your critical value must reflect the fact that you’re performing a two-tailed test.

   Extra credit: Calculate the p-value of this t-statistic.
(c) Some Irish politics expert argues that incumbent TDs on average gain 1000 more 1st preference votes than non-incumbents. Test this hypothesis in form of a constrained F-test. Please do this first “manually” and then with the help of the \texttt{anova()} function. 
Hints: The Faraway chapter discusses how to constrain coefficients in R. Also note that the critical F-value you have to compute must be based on a one-sided test (choose $p$ respectively).

(d) Calculate the predicted number of first preference votes for one specific candidate who is an incumbent TD and whose spending is average. Please do it the “tedious way” first and then verify your result with the \texttt{predict()} function.

(e) The aim is to calculate a bootstrap estimate for the coefficient of total spending. In order to do so, you draw a 1000 times a bootstrap sample and run the regression, and then report the mean and standard deviation of the obtained coefficients. 
Hint: You may find the lecture slides inspiring.