# Optional practice problems

Stat 151A, Fall 2017

September 23, 2017

1. Complete the missing values in the following R output complete

```
> summary(mod1)

Call:
lm(formula = prestige ~ education + income, data = dat)

Residuals:
Min       1Q   Median       3Q      Max
-19.4040  -5.3308   0.0154   4.9803  17.6889

Coefficients:
             Estimate   Std. Error  t value Pr(>|t|)
(Intercept) -6.8477787  3.2189771  -2.127   XXXXX
education    XXXXX      0.3489120   11.858  < 2e-16 ***
income       0.0013612  0.0002242   6.071 2.36e-08 ***
---
Signif. codes:  0 âĂŸ***âĂŹ 0.001 âĂŸ**âĂŹ 0.01 âĂŸ*âĂŹ 0.05 âĂŸ.âĂŹ 0.1 âĂŸ âĂŹ

Residual standard error: 7.81 on XXXX degrees of freedom
Multiple R-squared:  0.798,        Adjusted R-squared:  0.7939
F-statistic: 195.6 on 2 and 99 DF,  p-value: < 2.2e-16
```

2. For the output above construct %95 confidence intervals for the coefficients of each of the exploratory variables.

3. For the following statements determine whether they are true of false. In each case provide a reason behind your choice.

   (a) In a simple linear regression model with $n > p$, if $(\beta_0, \beta_1)$ is not estimable then $\beta_1$ is not estimable.

   (b) In the linear regression model, the ols estimator is biased if the errors are correlated.

4. Consider the linear model with $J$ groups

$$\begin{aligned} y_i &= \mu_1 I(i \in 1st) + \ldots + \mu_J I(i \in Jth) + \epsilon_i \\ &= \mu_1 x_{1i} + \ldots + \mu_J x_{Ji} + \epsilon_i. \end{aligned}$$

Show that the ols estimator $\hat{\mu}$ satisfies

$$\hat{\mu}_j \;=\; \frac{1}{n_j} \sum_{i \in jth \text{ group}} y_i$$

where $n_j$ is the number of observations $i$ in group $j$.

5. The following problems from the book: 5.3, 5.4, 6.6, 9.8,