honor statement: "I have completed this work independently. The solutions given are entirely my own work."

1. (10 points) An economist is interested in the effect of the rising price of gas on drivers. He puts an ad on the radio, "Call 1-800-GAS-PUMP, and let me know what you think about the costly price of gasoline." This is obviously a terrible way to conduct a survey. Identify three ways bias could enter the study.

1. Sampling selection bias, the survey would only pick the sample in the population who used to listen to the radio, so people have a chance to get this ad and make the phone call, however, people who listen to the radio can not represent the whole population.
2. Informing in advance that this is a costly price of gasoline survey will lead respondents to answer that oil prices are rising, so they would have a negative response on the survey.
3. Researchers could be consciously looking for patterns or information in their data to just confirm the ideas that they already know.

2. (10 points) Yvette is a young banker. She and all her friends carry cell phones and use them heavily. Last year, two of Yvette's acquaintances developed brain tumors. Yvette wonders if the tumors are related to use of cell phones. Explain why the experience of Yvette's friends does not provide good evidence that cell phones cause brain tumors.

It should be an observational data which we get into the real world and collect what we can see, however, it is hard to choose specific features that we want to study as well as the levels that we are going to apply to those features.

The response variable that we want to get is the tumor, it is not easy to identify someone who you know that was diagnosed with a tumor.

On the other hand , there is no concrete evidence that the tumor was caused by the cell phone, there are some features that we can not control that would cause the brain a tumor to grow.

In this observational data , first of all , we can not select the factors to be included,nor determine the number of observations, so it could not provide good evidence that cell phones cause brain tumor.

3. A manufacturer of food products uses package liners that are sealed at the top by applying heated jaws after the package is filled. The customer peels the sealed pieces apart to open the package. What effect does the temperature of the jaws have on the force required to peel the liner? To answer this question, the engineers prepare 60 pairs of pieces of package liner. They seal five pairs at each of 250 F, 275 F, 300 F, and 325 F of

three different types of liner (A, B, C). Then they measure the peel strength of each seal.

a. (5 points) Identify the experimental units or subjects

Pieces of package liner

b. (5 points) Identify the factors

Temperature

c. (5 points) Identify the treatments

250 °F
275 °F
300 °F
325 °F

d. (5 points) Identify the response variables

peel strength

e. (5 points) Write the regression model for this experiment.

Peel strength of each seal = $\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4$
β_0 = constant or intercept
β_1 = slope at condition of 250 °F in the x_1
β_2 = slope at condition of 275 °F in the x_2
β_3 = slope at condition of 300 °F in the x_3
β_4 = slope at condition of 325 °F in the x_4

f. (5 points) Is this a Randomized Block Design? Explain.

Yes, it is a Randomized Block Design. We can notice that 60 pairs of pieces of package liner are grouped into three different types of liner (A, B, C) at which they seal five pairs at each of 250 °F, 275 °F, 300 °F, and 325 °F as a treatments.