1. (10 pts) Write two or more paragraphs to **compare** and **contrast** the two most important types of errors that can occur during the modeling process. As **part** of your discussion, make sure to address which type of error is easier to avoid.

2. (10 pts) Can a model be (**precise**) and (**NOT descriptively realistic**) at the same time?
   If so, **give an example** of such a model **and explain why** it satisfies these criteria.
   If not, explain **in detail** how this is an impossibility.

3. (a) (5 pts) What does it mean when we say that two variables are highly correlated?
   Give a conceptual answer; **do not** simply give a number.

   (b) (5 pts) Whenever two variables are highly correlated, what can you say about causation between the variables?

4. (5 pts) If the per capita birth rate of an animal population is 1.5 births per month per animal and the per capita death rate is 0.5 death per month per animal, and the population at the beginning of January is 30 animals, what will be the population at the beginning of July?

5. Suppose you are trying to find a least-squares best fit function of the form $y = Ck^x$ for the (x, y)-dataset $\{(-1, 3), (0, 4), (1, 6), (2, 9)\}$.

   (a) (8 pts) Explain using multiple sentences the method you would use if you **perform least squares by hand**.
   DO include an explicit expression that needs to be minimized.
   DO NOT actually find the constants C and k.

   (b) (7 pts) Write down *one or more lines* of *Mathematica* code that **will** solve for the unknown constants C and k.
   [In part (b), explanations are not necessary but can help your case for partial credit.]

6. (5 pts) Suppose that you have already evaluated the following lines of code:

```
data = {{3,9}, {4,16}, {5,25}, {6,36}, {7,49}};
scatter = ListPlot[data];
graph = Plot[x^2 + 3x, {x,0,10}];
```

   Write down *one or more lines* of *Mathematica* code that lets you present the scatterplot of data **together** with the graph of the curve **in the same graphic**.