Midterm 2 Study Guide

This midterm is about probability concepts, as well as linear modeling.

This is meant to be a representative sampling of the key concepts you will need to know, and it is not meant to be exhaustive. You should make sure that you are comfortable with Quizzes 5-7 and Homework Assignments 8-11.

- 1. When we have a regression line fitted to some data, explain the following terms: predicted value, actual value, residual, sum of squared residuals.
- 2. What is the key property that makes the "least squares regression line" special?
- 3. What is the meaning of "r-squared" in the context of the least squares regression line?
- 4. How does the *residual plot* work? What do we expect from it if we have a suitable fit?
- 5. Outliers far in the x direction and only far in the y direction affect the least squares regression line in very different ways. Explain.
- 6. What are the key characteristics of a random phenomenon?
- 7. What can we say about the probabilities of outcomes in a random phenomenon / probability model? Can they be any numbers? There are some restrictions to them (both on what numbers they can be, and on what their sum must be).
- 8. What is an event and how do we define its probability?
- 9. What is the complement of an event? What is a formula for its probability?
- 10. What is the *union* of two events, what is the *intersection* of two events? What rule must their probabilities obey?
- 11. What is the definition of *conditional probability*? Include a formula and also a more meaningful verbal definition.
- 12. What does the multiplicative rule say?
- 13. When do we say that two events are *independent* of each other? Provide some examples both of events that are independent of each other and events that are not independent of each other.
- 14. In general when do we tend to multiply probabilities? When do we tend to add them?
- 15. When can I say that $P(A \cap B) = P(A)P(B)$?
- 16. When can I say that $P(A \cup B) = P(A) + P(B)$?
- 17. What are the different parts in a tree diagram / decision tree? What probabilities do we associate with each part?