Material Covered

All tests are cumulative, but Test 2 will focus on Chapter 6. The following topics were not covered: 6.4.4 (formal definitions of leverage and influence), 6.6.3 (power of t-tests).

Format

The exam will include both an in-class portion and a take-home portion.

Things to be sure you review

This is not intended to be an exhaustive list, but the items below are important things to review.

- Point Estimates for Parameters in a (Simple) Linear Model
  - The method of Least Squares Estimation
    * Fitting least squares estimates using linear algebra (projections of vectors)
    * Fitting least squares via calculus (partial derivatives)
  - Maximum likelihood for linear models
    * Yields same estimates as least squares method (for simple linear model)

- Linear Models and Linear Algebra
  - The colorful picture and all of the vectors on it
  - Dot products and projections and how they are used to fit a linear model
  - How ANOVA tables tests relate to the vectors
  - degrees of freedom

- Applying linear models
  - Model formulas and interpretation of parameters
  - Categorical predictors and coding schemes used for them
  - Transformations (how and why)
  - Fitting linear models with \texttt{lm()} and interpreting the output of \texttt{summary(model)} and \texttt{anova(model)}
  - Confidence and Prediction intervals for linear models
  - Using \texttt{confint()}, \texttt{makeFun()}, and \texttt{plotFun()}

- Regression diagnostics
  - Residuals and residual plots (\texttt{plot()}, \texttt{mplot()})
  - Outliers and influence
  - Using transformations to improve the model

- Logistic regression
  - Specification of the model
○ The logit transformation and why it is used.
○ Fitting with \texttt{glm()}
○ Using \texttt{makeFun()} to obtain the model fit function. (Note: By default, \texttt{makeFun()} does the back transformation to the probability scale for you.)
○ Interpreting parameters, estimates, and model fit

- \(F\), \(T\), and \(\text{Chisq}\) distributions and how they arise in the context of linear models

- Miscellaneous
  ○ t-tests
    * one-sample, paired, and Welch’s 2-sample
    * \texttt{t.test()} 
  ○ Chi-squared tests
    These were covered in Chapter 5, so they are covered under the “all tests are cumulative” clause. But they also complete our taxonomy of 2-variable analysis, so you should not forget about them.

**Further suggestions**

- No mystery numbers allowed. It should be clear where every number comes from.
- Use notation well.
  ○ You are required to understand and use the notation we have introduced in class. This includes correct use of the equals sign (=).
  ○ You may invent notation as long as you explain it.
- Don’t be afraid to use words.
  In any case, do your work in “paragraph order” (left to right, top to bottom).