Test 1 Topics

1. Understand hypothesis testing. Setting up null and alternative hypothesis, calculating the test statistic and evaluating the conclusion based on p-value or critical value.
2. Create confidence intervals and interpret.
3. Find critical values and p-values of t and F distributions. Be able to write the R code by hand.
4. Know the five assumptions for a linear regression and explain
   (a) Existence
   (b) Linear
   (c) Independent
   (d) Normal Distribution of Y about any X
   (e) Constant Variance
5. Assess a scatter plot for the function form of the graph.
6. Write the general form of the linear regression based on the function form assessed from the graph.
7. Calculate the least squares estimate of a line.
8. Know the two conditions of the error/residuals for a least squares estimate.
9. Be able to prove or develop the formula for a least squares regression for a function using calculus.
10. Slope
    (a) Interpret the slope
    (b) Assess the significance of the slope for $\beta_1 = 0$ or for some other slope value.
    (c) Create the confidence interval of the slope and interpret.
11. Intercept
    (a) Interpret the intercept and assess if it is meaningful
    (b) Assess the significance of the intercept for $\beta_0 = 0$ or for some other intercept value.
    (c) Create the confidence interval of the intercept and interpret.
12. Predict
    (a) Know whether a predicted value is valid based on the range of x.
    (b) Calculate the predicted value.
    (c) Create the confidence interval of the predicted value (only plug into the formula, but not evaluate) and interpret.

13. Mean at X_0, $\mu_{Y|X_0}$
    (a) Calculate the estimated value of $\mu_{Y|X_0}$
    (b) Assess the significance of $\mu_{Y|X_0}$ at a given mean value.
    (c) Create the confidence interval of $\mu_{Y|X_0}$ and interpret.
14. Calculate SSE and MSE from data.
15. Be able to read R output for linear regressions
16. Be able to write any code for a linear regression problem given a data set.