Statistics 512: Homework#2
Due January 31, 2014 BEFORE CLASS

1. For conducting statistical tests concerning the parameter β_1, why is the t test more versatile than the F test?

2. When testing whether or not $\beta_1 = 0$, why is the F test a one-sided test even though H_a includes both $\beta_1 < 0$ and $\beta_1 > 0$? [*Hint*: Refer to (2.57).]

The next 5 problems continue the analysis of the plastic hardness data begun in the first homework.

3. Plot the data using `proc gplot`. Include a smoothed function on the plot by using the `i = smnn` option on the `symbol1` statement, where `nn` is a number between 1 and 99. Is the relationship approximately linear?

4. Plot the 95% bounds (confidence band) for the mean (use `i=rlclm` on the `symbol1` statement).

5. Plot the 95% bounds for individual observations (using `i=rlcli`).

6. Give an estimate of the *mean* hardness that you would expect after 36 and 43 hours; and a 95% confidence interval for each estimate. Which confidence interval is wider and why is it wider?

7. Give a prediction for the hardness that you would expect for an *individual* piece of plastic after 43 hours; give a 95% prediction interval for this quantity.

8. Calculate power for the slope using the results of text Problem 1.22 as follows. Assume $n = 16$, $\sigma^2 = MSE$, and $SS_X = 1280$. (Note: this last value could be obtained with SAS using

   ```
   proc univariate data = (dataset name);
   var time;
   ```

   and looking at the output titled "`Corrected SS`" in the `Moments` section.)

   (a) Find the power for rejecting the null hypothesis that the regression slope is zero using an $\alpha = 0.05$ significance test when the alternative is $\beta_1 = 0.5$.

   (b) Plot the power as a function of β_1 for values of β_1 between -2.5 and +2.5 in increments of 0.25 .

9. Given that $R^2 = SSM/SST$, it can be shown that $R^2/(1 - R^2) = SSM/SSE$. If you have $n = 28$ cases and $R^2 = 0.3$, what is the F-statistic for the test that the slope is equal to zero?