Final 2012 – Solutions

1) FALSE. While it is true that OLS is inefficient under heteroskedasticity, inefficiency is not the reason the usual *t* and *F* tests are invalid. The reason they are invalid is that under heteroskedasticity, the variance of $\boldsymbol{b}$ is not equal to the usual $\sigma^2(X'X)^{-1}$ matrix. See pg.2, lecture 11.

2) FALSE. Not quite. The null hypothesis in each case is that IV is not needed. See pg. 10, lecture 6.

3) See pg. 10-12, lecture 3.

4) Two tests covered in class are White's test (pg.5 lecture 12) and the Goldfeld-Quandt test (pg.6 lecture 12).

5) In the Likelihood Ratio Test, when H_0 is nested within H_1, we are essentially comparing the likelihood of observing the data under the restricted (null) model against the unrestricted (alternative) model. Our test statistic is:

$$LRT = 2\log(L_1 - L_0)$$

$L_1 \geq L_0$, since imposing restrictions on L_1 cannot increase the optimized value of likelihood. If the restrictions are true, then $L_1 = L_0$. If there is much difference between the two likelihood functions, we reject the null.

6) Usually the derivative of a nonlinear function is nonlinear itself. These derivatives must be solved as first-order-conditions when minimizing the sum of squared residuals, in order to solve for the NLLS estimator. See pg. 3, lecture 10.

7) Including an irrelevant regressor – OLS loses efficiency. Excluding a relevant regressor – OLS loses bias and consistency. Usually the latter loss is considered more severe.

8) See Q1, Assignment #1.

9) See Q3, Assignment #2.

10) See Q2, Assignment #3.