Economics 113 Professor Spearot
Introduction to Econometrics
Fall 2012 – Midterm 3
Name _____ ID_____

Midterm 3 –60 Points

You must answer all questions. Please write your name on every page. The exam is closed book and closed notes. You may use calculators, but they must not be graphing calculators. No cell phones. Do not use your own scratch paper.

You must show your work to receive full credit

I have neither given nor received unauthorized aid on this examination, nor have I concealed any similar misconduct by others.

*Signature*_____

Suppose that you wish to predict light truck prices as a function of a few basic characteristics:

$$\log(price) = \beta_0 + \beta_1 \log(weight) + \beta_2 log(length) + \beta_3 log(width) + \beta_4 log(cyl) + u$$

Here, *price* is measured in dollars, *weight* is measured in pounds, length and width are measured in inches, and *cyl* is the number of cylinders in the engine. The results from estimating this equation are below:

```
      Source |       SS       df       MS              Number of obs =    3297
-------------+------------------------------           F(  4,  3292) =  499.65
       Model |  90.4147706     4  22.6036926           Prob > F      =  0.0000
    Residual |  148.927025  3292  .045239072           R-squared     =  0.3778
-------------+------------------------------           Adj R-squared =  0.3770
       Total |  239.341795  3296  .072615836           Root MSE      =  .21269
------------------------------------------------------------------------------
    logprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   logweight |    1.091928   .0322143    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
   loglength |    -.173286   .0357808    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
    logwidth |   -1.001126   .0807677    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
      logcyl |    .0428736    .025818    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
       _cons |    5.942897   .2774355    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
------------------------------------------------------------------------------
```

a.) Using the 95% confidence level, test whether the coefficient on *log(cyl)* is significantly different from zero. Please state your null and alternative hypotheses, and briefly interpret the result. **(10 Points)**

b.) Suppose I claim that the elasticity of *price* within respect to *width* is not equal to -1. What is the probability that I'm wrong? **(10 Points)**

c.) Suppose I claim that $\beta_1 + \beta_3 = 0$. Please state a null and alternative hypotheses that can test this claim, and derive an equation that allows me to test the null against the alternative. Show your work!! **(10 Points)**

d.) I decide that I'm adding too many variables in predicting the vehicle price. Instead I estimate

$$\log(price) = \beta_0 + \beta_2 log(length) + \beta_4 log(cyl) + u$$

The results from estimating this equation are below:

```
      Source |       SS       df       MS              Number of obs =    3297
-------------+------------------------------           F(  2,  3294) =  309.32
       Model |  37.8161576     2  18.9080788           Prob > F      =  0.0000
    Residual |   201.66028  3294  .061127699           R-squared     =  0.1579
-------------+------------------------------           Adj R-squared =  0.1574
       Total |  239.476438  3297  .072546634           Root MSE      =  .24724
------------------------------------------------------------------------------
    logprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   loglength |   .3153531   .0362388    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
      logcyl |   .4304159   .0246745    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
       _cons |    7.38903   .1782998    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
------------------------------------------------------------------------------
```

Is this model preferred to the model in 'a'? Please test this at the 95% level, stating your null and alternative hypotheses. Show your work!!! **(10 Points)**

e.) I'm having second thoughts about using logs, and instead estimate the following:

$$price = \beta_0 + \beta_1 weight + \beta_2 cyl + \beta_3 ltr + u$$

Where the additional variable *ltr* is the liters displacement by the engine. The results are below:

```
      Source |       SS       df       MS              Number of obs =    3298
-------------+------------------------------           F(  3,  3294) =  485.49
       Model |  3.2852e+10     3  1.0951e+10           Prob > F      =  0.0000
    Residual |  7.4300e+10  3294  22556107.4           R-squared     =  0.3066
-------------+------------------------------           Adj R-squared =  0.3060
       Total |  1.0715e+11  3297  32499913.2           Root MSE      =  4749.3
------------------------------------------------------------------------------
       price |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      weight |   4.012499    .134814    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
         cyl |   447.3331   117.2983    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
         ltr |  -635.1207   114.4063    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
        cons |    3137.16   573.5268    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
------------------------------------------------------------------------------
```

Please construct a 90% confidence interval for the coefficient on *weight*. Please interpret this confidence interval. **(10 Points)**

f.) Finally, after generating the new variables, I run the following regression:

$$price = \beta_0 + \beta_1(weight - 5000) + \beta_2(cyl - 8) + \beta_3(ltr - 5.4) + u$$

The results are below:

```
      Source |       SS       df       MS              Number of obs =    3298
-------------+------------------------------           F(  3,  3294) =  485.49
       Model |  3.2852e+10     3  1.0951e+10           Prob > F      =  0.0000
    Residual |  7.4300e+10  3294  22556107.4           R-squared     =  0.3066
-------------+------------------------------           Adj R-squared =  0.3060
       Total |  1.0715e+11  3297  32499913.2           Root MSE      =  4749.3

------------------------------------------------------------------------------
       price |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
weight - 5000|   4.012499    .134814    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
     cyl - 8 |   447.3331   117.2983    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
   ltr - 5.4 |  -635.1207   114.4063    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
       _cons |   23348.67   124.8494    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
------------------------------------------------------------------------------
```

Please construct a 95% confidence interval for the constant. Please interpret this confidence interval. **(10 Points)**

Normal Distribution from -oo to Z

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990