ARC is free software and can be downloaded from (https://www.stat.umn.edu/arc/software.html). Follow the software link.

To get on *ARC*, type arc in the lower right bar, in the same manner that you get into SAS. To quit *ARC*, move curser to the **x** in the northeast corner and click.

Warning: Some of the following problems uses data from the webpage (http://parker.ad.siu.edu/Olive/lregbk.htm). Save the data files on a flash drive G, say. Get in *Arc* and use the menu commands "File > Load" and a window with a *Look in box* will appear. Click on the black triangle and then on *Removable Disk (G:)*. Then click twice on the data set name.

1) Get *cbrain.lsp* as described above. (Activate the *cbrain.lsp* dataset with the menu commands "File > Load > Removable Disk (G:) > cbrain.lsp.") Scroll up the screen to read the data description. You can also make similar plots with the Banknote data of 2).

a) (Scatterplot in `ARC`.) Make a plot of *age* versus brain weight *brnweight*. The commands "Graph&Fit > Plot of" will bring down a menu. Put *age* in the **H** box and *brnweight* in the **V** box. Put *sex* in the **Mark by** box. Click **OK**. Make the **lowess bar** on the plot read .1.

b) (Scatterplot matrix.) Select *age, breadth, cephalic, circum, headht, height, length, size,* and *sex*. Also place *sex* in the *Mark by* box.

c) (Response Plot.) From *Graph&Fit* select *Fit binomial response*. Select *brnweight, cephalic, breadth, cause, size,* and *headht* as predictors, *sex* as the response and *ones* as the number of trials. Perform the logistic regression and from *Graph&Fit* select *Plot of*. Place *sex* on *V* and *B3:Eta'U* on *H*. From the *OLS* popup menu, select *Logistic* and move the slider bar to 1. From the *lowess* popup menu select *SliceSmooth* and move the slider bar until the fit is good. Are the slice means (observed proportions) tracking the logistic curve (fitted proportions) very well?

d) LRT tests: From the *B1* menu, select *Examine submodels* then *Change in deviance for fitting each term last*. Click on "OK."

2) Activate *banknote.lsp* in *Arc*. From *Graph&Fit* select *Fit binomial response*. Select *Top* and *Diagonal* as predictors, *Status* as the response and *ones* as the number of trials.

a) From *Graph&Fit* select *Plot of*. Select *Diagonal* for *H, Top* for *V, Case-numbers* for *O,* and *Status* for *Mark by*. From the 3D plot, select *Recall logistic(H,V)* from the popup menu *Recall/Extract*. Include this plot in *Word*. How good is this model at classifying counterfeit and real money?

b) From *Graph&Fit* select *Fit linear LS*. Select *Diagonal* and *Top* for predictors , and *Status* for the response. From *Graph&Fit* select *Plot of* and select *L2:Fit-Values* for *H, B1:Eta'U* for *V,* and *Status* for *Mark by*. Is the plot linear? How are $\hat{\boldsymbol{\eta}}_{OLS}^{T}\boldsymbol{u}$ and $\hat{\boldsymbol{\eta}}_{logistic}^{T}\boldsymbol{u}$ related (approximately)?

3) Activate *possums.lsp* with the commands
"File > Load > Data > Arcg > possums.lsp." Scroll up the screen to read the data description.

a) From *Graph&Fit* select *Fit Poisson response.* Select y as the response and select *Acacia*, *bark*, *habitat*, *shrubs*, *stags* and *stumps* as the predictors.

b) From *Graph&Fit* select *Fit Poisson response.* Select y as the response and select *bark*, *habitat*, *stags* and *stumps* as the predictors.

c) Response plot: From *Graph&Fit* select *Plot of.* Select *P2:Eta'U* for the H box and y for the V box. From the OLS popup menu select *Poisson* and move the slider bar to 1. Move the *lowess* slider bar until the lowess curve tracks the exponential curve well. Try putting the response plot in *Word*.

e) Change in deviance test. From *Graph&Fit* select *Fit Poisson response.* Select y as the response and select *Acacia*, *bark*, *habitat*, *shrubs*, *stags* and *stumps* as the predictors. Include the output in *Word*. This is your full model and the reduced model output was obtained in b). This output is needed to perform the 4 step change of deviance test.

f) Make a response plot for the full model (select *P1:Eta'U* for the H box and y for the V box) and try including the plot in *Word*.

g) LRT tests: From the *P1* menu, select *Examine submodels* then *Change in deviance for fitting each term last.* Click on "OK."

h) EE plot. From *Graph&Fit* select *Plot of.* Select *P1:Eta'U* for the H box and *P2:Eta'U* for the V box. Move the OLS slider bar to 1. Click on the *Options* popup menu and type "y=x". Include the plot in *Word*. Is the plot linear?