Math 484: Lab 1 Monday, August 29 in Neckers 258 back: computers 11-25. Login to one of these computers before Monday since the initial login can take 10 minutes. The computer on button is in the upper left corner while the monitor on button is in the lower right corner. You may need to press a computer keyboard key to get the login and password bars to appear.

The computer lab login is like logging into salukinet. If necessary, hit Ctrl, enter your AD\siu8... (dawg tag) and your password. Left click the lower left icon, or near the lower left icon, search for Arc, SAS, etc. Left double click the `ARC` icon.

Hopefully, *Arc* and *R* are on computers 11–25, Minitab is on computers 11–13, 18–21, 23–25, and SAS is on computers 11-25 or 13, 16-19, 21, 23, and 25. The SAS license could expire soon. *Arc* and *R* are free software that can be downloaded on your personal computer. See text and syllabus for URLs. *Arc* is missing from computers 14, 23, 24.

Click the Internet icon and search for David Olive. His personal page (http://parker.ad.siu.edu/Olive/) has links to *Multiple Linear and 1D Regression*, *Linear Regression* (http://parker.ad.siu.edu/Olive/lregbk.htm), and Some Links for Students which has information on Math 484, Math and Statistics Texts, and the SIU Actuarial program. The Math 484 webpage is (http://parker.ad.siu.edu/Olive/M484.html).

The URL (http://parker.ad.siu.edu/Olive/rch17.pdf) has more information on *Arc* and *R* as well as some answers to problems for the old version of the text *Multiple Linear and 1D Regression*. This corresponds to ch. 14 of the current version of the text. Scroll through the file to see what it has.

To quit `ARC`, move cursor to the **x** in the northeast corner and click.

Th URL (http://parker.ad.siu.edu/Olive/lregbk.htm) has the cbrain.lsp file. Save the cbrain.lsp file on your flashdrive. HW1 will call your flashdrive "Removable Disk (G:)" but another name will be used like "Kingston D" if Kingston is the name of your flashdrive and you insert your flashdrive into D instead of G.

Arc is free software from (www.stat.umn.edu/arc/). Getting this software on you computer will save time compared to using the Math lab computers.

For homework 1 A) (written as HW1 A), the "File > Load > Removable Disk (G:) > cbrain.lsp" commands will produce a window, click on your flashdrive and then click on the cbrain.lsp file that you saved on your flashdrive. This process can take a few minutes in the computer lab.

For computers in the computer lab, near the lower left icon, search for Word (or Word 2013). When Word opens, click on the blank document icon near the upper right of the window that opens for word. The command "CTRL c" means press the CTRL and c keys at the same time. These commands make a copy of your plot. Then click on Word and use the command "Ctrl v" to paste the plot in Word. Eventually, you want to save the Word document on your flashdrive, and either print the document or email it to me.

Do problem B) in a similar manner.

Problem C) is a Minitab problem. Near the lower left icon, search for "Minitab" or "Minitab 17". When Minitab opens, do the commands "File>open worksheet> (Student 9 >) prof.mtw." A window will open saying that "a copy of the ... file wil be ...." Click on "ok," and follow the directions for the problem. Several computers with Minitab need additional commands: you may need to click on a "Open sample Minitab data" near the bottom of the screen. One computer, near 11, did not work.

Follow the instructions for Problem D).

SAS (www.sas.com) or (https://www.sas.com/en_us/home.html) has a free SASOn-Demand for Academics (old SAS University Edition) and free tutorials for SAS programming. You can request materials from the SAS institute as well. They make these available for free for professors to use in teaching. They have some nice examples and data sets. See SAS Academic Program (https://www.sas.com/en_us/learn/academic-programs/educators.html) or (http://support.sas.com/learn/ap/prof/index.html) for information.

There are some nice examples in SAS Statistics 1, this is also now available free as an e-course for anyone. (https://support.sas.com/edu/elearning.html?ctry=us&productType=library) SAS Training in the United States – e-Learning

This includes a SAS programming course.

Google SAS>Ad (www.sas.com) >How to buy>academic

http://www.sas.com/en_us/software/trials-demos.html

Google SAS User's Guide

See Olive (2017) text ch. 2 Problems: p. 75 above Problem 2.17 for SAS. See ch. 2 and 3 problems for more on SAS and R.

The *Linear Regression* webpage has links to R code and SAS programs for the text's HW (http://parker.ad.siu.edu/Olive/lreghw.txt). Copy and paste the two source commands near the top of the file into *R* for many of the text's *R* HW problems. Scroll down for code for each *SAS* and *R* problem. The source codes get *R* programs and *R* data needed for some of the homework into *R* quickly.

E) is a SAS problem. More information will come once the Math lab computers can access SAS.

2.17) SAS: Google David Olive, get on his website, click on the Linear Regression website, click on the lreghw.txt link, highlight the program for problem 2.17. Hit Ctrl–c. Type sas in the search window near the lower left icon. Double click the `SAS` icon. The editor window is the lower window. Click on that window, then hit Ctrl–v to paste in the program. Then run>submit. Output will appear in a few minutes.

In Windows 10, when you want to log out, hit Ctrl-Alt-Delete and a menu will appear with the option to logout. You can also right click the lower left window icon and youll see a sign out or shut down option.

search word, copy and paste the SAS output into Work. Save file on flashdrive as HW2.17

Possible Lab problems

A) is E) above

B) 2.18) SAS: as in A) copy and paste the program into SAS.

Copy and paste SAS output into Word. Save file as HW2.18.

When you get out of R, do not save the workspace image since you can copy and paste code into R quickly.

C) 2.27 Get the *R* commands for this problem from (http://parker.ad.siu.edu/Olive/lreghw.txt).

D) 2.28 Get the *R* commands for this problem from (http://parker.ad.siu.edu/Olive/lreghw.txt). The data is such that $Y = 2+x_2+x_3+x_4+e$ where the zero mean errors are iid [exponential(2) - 2]. Hence the residual and response plots should show high skew. Note that $\boldsymbol{\beta} = (2, 1, 1, 1)^T$. The *R* code uses 3 nontrivial predictors and a constant, and the sample size $n = 1000$.

a) Copy and paste the commands for part a) of this problem into *R*. Include the response plot in *Word*. Is the lowess curve fairly close to the identity line?

E) 2.21 Arc In *Arc* enter the menu commands "File>Load>Data" and open the file *mussels.lsp*. This data set is from Cook and Weisberg (1999a).

The response variable Y is the mussel muscle mass M, and the explanatory variables are $X_2 = S =$ shell mass, $X_3 = H =$ shell height, $X_4 = L =$ shell length, and $X_5 = W =$ shell width.

Enter the menu commands "Graph&Fit>Fit linear LS" and fit the model: enter *S*, *H*, *L*, *W* in the "Terms/Predictors" box, *M* in the "Response" box and click on *OK*.

a) To get a response plot, enter the menu commands "Graph&Fit>Plot of" and place *L1:Fit-Values* in the H–box and *M* in the V–box. Copy the plot into *Word.*

b) Based on the response plot, does a linear model seem reasonable?

c) To get a residual plot, enter the menu commands "Graph&Fit>Plot of" and place *L1:Fit-Values* in the H–box and *L1:Residuals* in the V–box. Copy the plot into *Word.*

d) Based on the residual plot, what MLR assumption seems to be violated?

e) Include the regression output in *Word*.

f) Ignoring the fact that an important MLR assumption seems to have been violated, do any of predictors seem to be needed given that the other predictors are in the model?

g) Ignoring the fact that an important MLR assumption seems to have been violated, perform the ANOVA F test.