Assignment (combined between this and the prior week’s activity; due Monday, May 13, 2019 at the start of your discussion lab class) (You must show your work for credit on all problems.)

(1) Complete a short survey via the link emailed to you and mid-quarter course evaluations.

(2) Using data that you obtained during the lab activity from last week (Lab #4), do the following.
   a. Part A: CA Data
      i. Submit one plot of your CA data containing four different labeled datasets each obtained for a different concentration of supporting electrolyte and with the y-axis on a logarithmic scale, which is facile to do using Excel.
      ii. Explain why we expect the datasets plotted in part i to be linear and what process is responsible for this linear behavior.
   b. Part B: CV and EIS Data
      i. For each CV dataset, indicate which one or two processes are likely dictating the slope of the data near the x-intercept and whether the concentration of supporting electrolyte is influencing the slope of the data.
      ii. For the CV data obtained using the smallest concentration of supporting electrolyte, the current at extreme polarization biases was not solely limited by diffusive mass transport. What type of flux also contributed to these mass-transport-limited currents and how should it have affected each of the cathodic and anodic mass-transport-limited currents?
      iii. For the CV data obtained using the largest concentration of supporting electrolyte, explain the cause of the significant positive shift in the value of the x-intercept in comparison to the other conditions measured. Also, using the EIS data, approximate the value of the high-frequency x-intercept of the Nyquist plot (Google it) as the series resistance in your cell and using that value and the CA data measured used the same concentration of supporting electrolyte, approximate the value of the interfacial capacitance. Show work.

(3) Using data that you obtained during the lab activity from this week (Lab #5), do the following. Assume that the carbon button electrode had a diameter of 3 mm, the platinum microelectrode had a diameter of 100 μm, and each half of the redox couple was 0.5 mM.
   a. Explain what a quasi-reference electrode is and why were you able to use one in most of these experiments.
   b. For the data obtained using the largest CA potential steps, indicate which plot would show the most linear trend in the data, e.g. log(y) vs x.
   c. For the data obtained using the smallest CA potential steps, indicate whether diffusion coefficients can be obtained in a straightforward manner and explain why.
   d. The Purpose section of this lab activity mentioned that there are five ways to calculate diffusion coefficients using data from CV, EIS (Warburg equation (Google it)), Cottrell analysis, and an Anson plot, each under conditions of linear diffusion, and CV under radial diffusion. Using each way, calculate D for at least one of the redox-active species. Show plots and work to support your conclusions.