Assignment *(combined between the last two activities; due Tuesday, February 28, 2017 at 8am PST)* (You must show your work for credit on all problems.)

1. For the data you obtained in the first lab (Lab #4), do the following. Note that by altering the concentration of supporting electrolyte, the transport/transference number of the redox-active molecules varied.
   a. Part A: CA Data
      i. Submit one plot of your CA data containing four different labeled data sets each obtained at a different concentration of supporting electrolyte and with the y-axis on a logarithmic scale (which can be plotted using Excel).
      ii. What process should be causing the shape of these curves? (Even if your data is not as we expected, interpret this question in the context of the expected behavior.) Also, explain why the data sets should be linear on the logarithmic y-axis scale used in part i?
   b. Part B: CV Data *(In class, I’ve shown you a classmate’s plot of the CV data.)*
      i. What process should be limiting the current near the x-intercept of each data set? Also, how should the shape of the data near the x-intercept be related to the concentration of supporting electrolyte?
      ii. At the lowest salt concentration, the value of the limiting current was not solely due to diffusive mass transport. What flux also contributed to the mass-transport-limited current and how should it have affected each of the cathodic and anodic mass-transport-limited currents?
      iii. Explain the cause of the significant change in the value of the x-intercept for the data obtained using the largest concentration of supporting electrolyte. Also, explain why an x-intercept shift in the positive direction was expected.

2. For the data you obtained *(and supplied to you)* related to the second lab (Lab #5), do the following. Assume that the carbon button electrode was exactly 3 mm in diameter, the commercial platinum UME was exactly 10 μm in diameter, and each half of the redox shuttle was present at a 1 mM concentration.
   a. In the Purpose section of this laboratory you were told that there are four ways to calculate the diffusion coefficients. Perform these four analyses, and supply plots and ample math to support your conclusions.
   b. Part C: CA Data
      i. What is a quasi-reference electrode and why were you able to use one in these experiments?
      ii. Explain why one does not expect the CA data for the large potential steps to be linear on a logarithmic y-axis scale.
      iii. You were also asked to perform a CA experiment under a potential step that was insufficient to oxidize/reduce all redox species at the surface of the electrode. Can one obtain the diffusion coefficient from those data in a straightforward manner? Explain why or why not.