Due date: Wednesday, Jan. 24

Griffiths reading: 7.1


2. [6 points] Griffiths 7.2 (RC circuits).

3. [4 points] Griffiths 7.3(a) (Relation of resistance and capacitance).
   Do Part (a) only. It may help to read the top of p. 299 carefully. Now consider a fictitious Gaussian surface surrounding the positively charged conductor. Using Gauss’s Law, relate $Q$ inside to the electric flux passing out through the Gaussian surface. Then, using $J = \sigma E$, relate that to the total current $I = \int J \cdot da$ flowing through this surface. Putting all this together and using $Q = CV$ and $V = IR$ should get you there.

4. [5 points] A wire of cross section $A$ stretches from $-\infty$ to $+\infty$ along the $x$ axis. The metal inside has a nonuniform conductivity $\sigma(x) = \sigma_0 e^{x^2/a^2}$. That is, the metal is the poorest conductor at $x=0$, and becomes a more and more perfect conductor as you go away from the origin. What is the total resistance of the wire, as measured from one end to the other? (Hint: Assume a uniform current and compute the voltage difference from one end to the other. A definite integral is required.)