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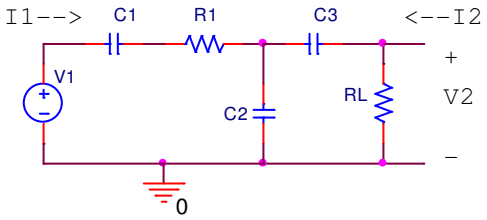
610 Fall 2012 – Homework 7

1. For the following circuit
   a) Find the 2-port admittance matrix.
   b) From that give the open-circuit (i2=0) voltage transfer function T(s)=v2(s)/v1(s)
   c) From T(s) directly calculate ∂T(s)/∂C2, ∂T(s)/∂C3, and ∂T(s)/∂R1
   d) Draw the adjoint circuit and use it to calculate the three derivatives of part c)



2. Discuss the possibility of taking derivatives with respect to a parameter of a function in the parameter by analyzing an adjoint circuit. Is the situation different if the function is not rational?

3. From the location of zeroes and poles of RC PR admittances (and impedances) one would expect that all zeroes of the even part of such admittances are on the negative real s-plane axis. Prove that this is the case and discuss what may happen at s=0.

4. From the results of problem 2,
   a. Give a general synthesis of PR RC admittances via the Richards' function noting difficulties which may occur at s=0.
   b. Use the results of a) to synthesize y(s)=s(s+2)/(s+1)
   c. Use the results of a) to synthesize the RC admittances of Problem #2 of Homework Set 6.