                610 Fall 2018 – Homework 1 Due Th 09/20/18
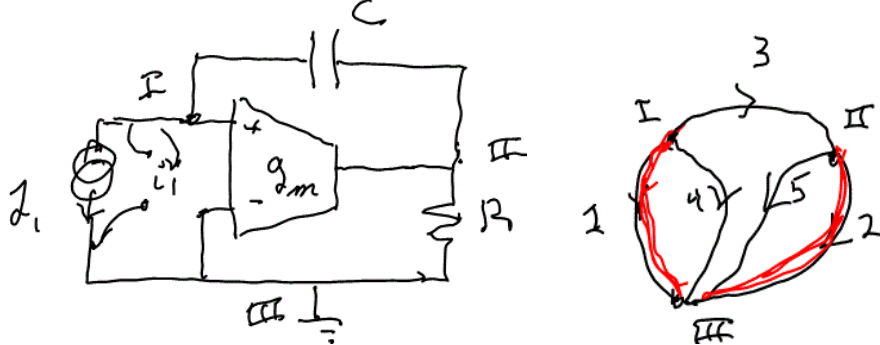
1. (50 points, circuit equations)

For the above circuit and its graph of the 09/11/18 class notes:
a) Replace the OTA by a gyrator of gyration conductance g and Add another add a current source pointed down as part of branch 2 (so the graph is unchanged).
b) Give the new Av=Bi equations and solve for the tree branch voltages versus the two current sources.
c) Give the port admittance and impedance matrices if nodes I and II to ground are the two ports of the 2-port.

2. (50 points, state variable realizations)
   For the input impedance

$$z(s) = (2s+6)/[(s+2)(s+6)]$$

a) Using the companion matrix for the denominator $(s^2+8s+12)$ give a state space realization, that is the state equations dx/dt=sx=Ax+Bu, y=Cx+Du with u=i, y=v so that

$$z(s)=C(s1_2-A)^{-1}B + D$$

b) Repeat by using a product realization with A having (as diagonal submatrices) the companion matrices for (s+2) and (s+6)
c) Comment upon state space realzation of the admittance y(s)=1/z(s).