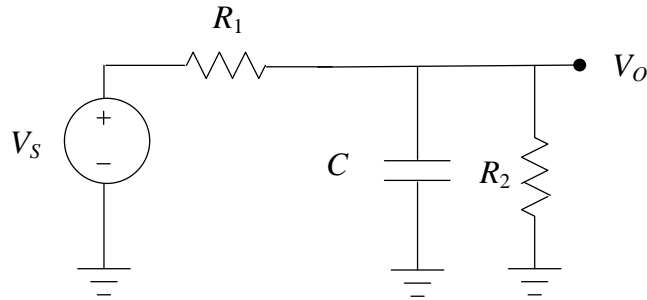


## ECE/CS 5720/6720

### Assignment for Week 2

- **Circuit Analysis Refresher.** Consider the circuit below:



- Derive the transfer function  $H(s) = V_O(s)/V_S(s)$  for this circuit.
  - Derive an expression for the dc gain of this circuit?
  - Derive an expression for the cutoff frequency of this circuit?
  - Assuming  $R_1 = 10\text{k}\Omega$ ,  $R_2 = 1\text{k}\Omega$ , and  $C = 1\mu\text{F}$ , sketch a Bode plot (magnitude and phase) for this circuit. Your frequency axis should extend approximately two or three decades on either side of the cutoff frequency. Label both the dc gain and cutoff frequency on these plots, and label your axes.
  - Assuming the same component values from before, what would be the steady-state output voltage if  $V_S = 3\text{V}$ ? If  $V_S = 0\text{V}$ ?
  - Assuming the same component values from before, sketch the expected output waveform if the input  $V_S(t)$  is a square wave going from  $0\text{V}$  to  $3\text{V}$  with a period of  $10\text{ms}$ .
- Read Chapter 2 in Johns & Martin.
  - Solve problems 2.2, 2.4, 2.6, 2.9, 2.10, 2.12, 2.13, and 2.16, showing your work.
  - This problem set (the  $RC$  circuit problem above and the problems from the textbook) should be turned in by Thursday, January 24, at 6:00 PM in the class locker on the 3<sup>rd</sup> floor of MEB.