ECE 321: Handout #1
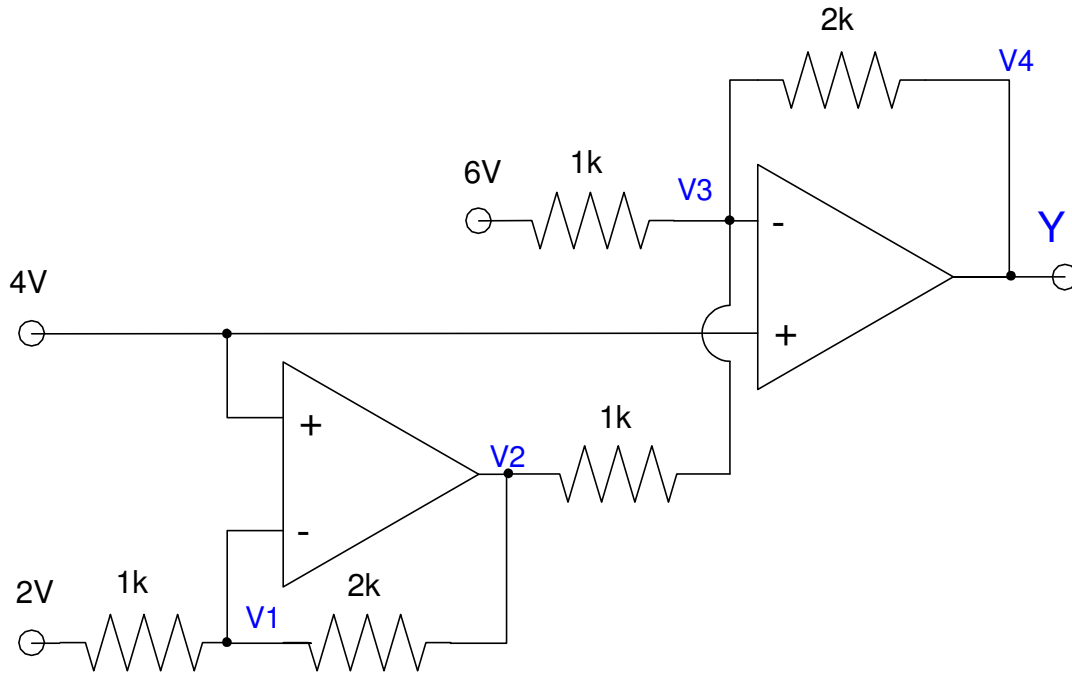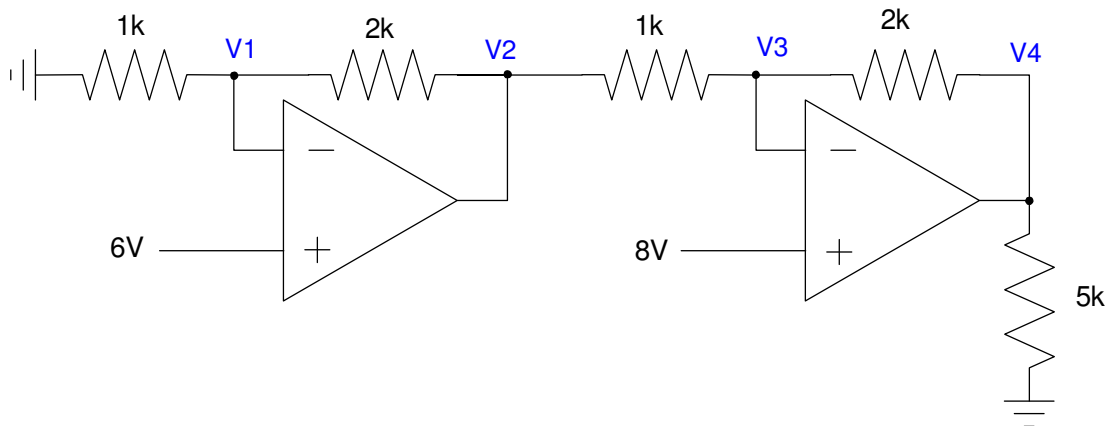
Op-Amps and Analog Circuits
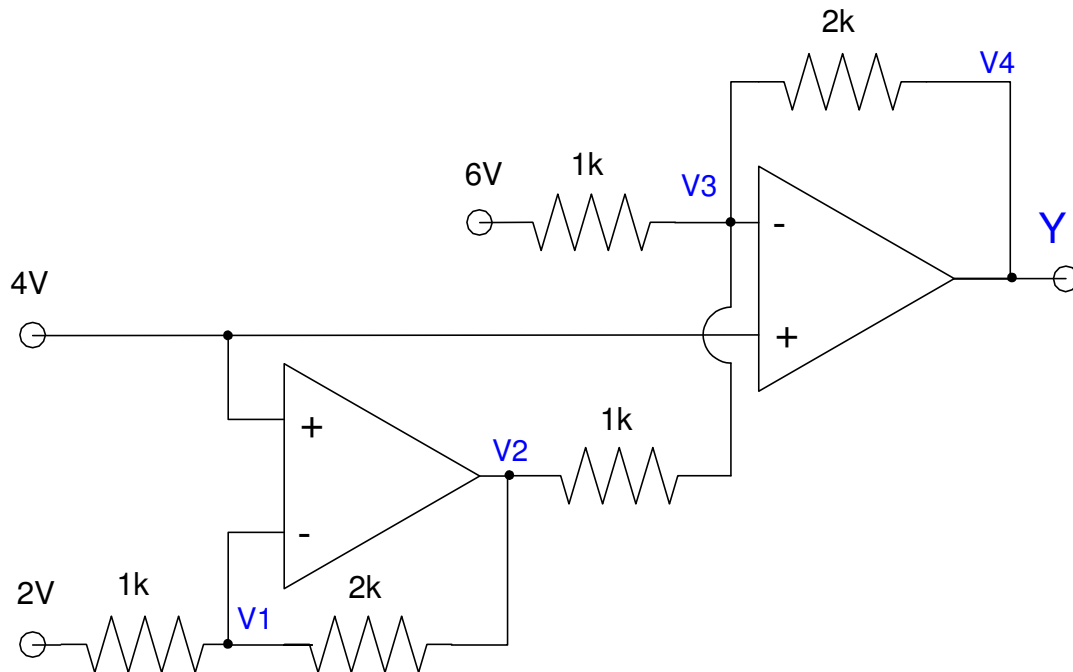
1) Write the voltage node equations. Assume ideal op-amps.

2) Determine the voltages and currents. Assume ideal op-amps.

3) Write the voltage node equations. Assume ideal op-amps.

4) Determine the voltages and currents. Assume ideal op-amps.

Problem #1: Write the Voltage Node Equations

Start with the easy ones: Vp = Vm

$$V_1 = 4$$

$$V_3 = 4$$

Write the node equation at V1

$$\left(\frac{V_1-2}{1k}\right) + \left(\frac{V_1-V_2}{2k}\right) = 0$$

Write the node equation at V3

$$\left(\frac{V_3-6}{1k}\right) + \left(\frac{V_3-\mathbf{V2}}{1k}\right) + \left(\frac{V_3-V_4}{2k}\right) = 0$$

2) Determine the voltages and currents. Assume ideal op-amps.

For an op-amp with negative feedback, Vp = Vm

At each node, current in = current out

Problem 3) Write the voltage node equations

Start with the easy ones (Vp = Vm)

$$V_1 = 6$$

$$V_3 = 8$$

Write the node equation at V1

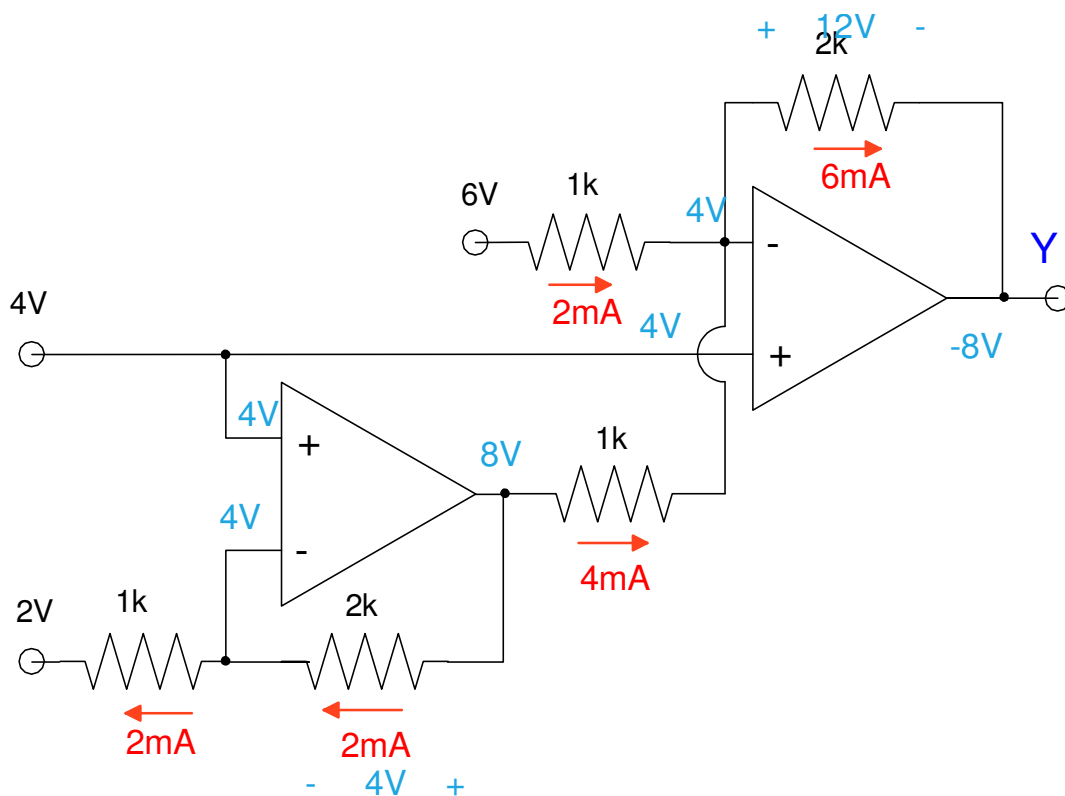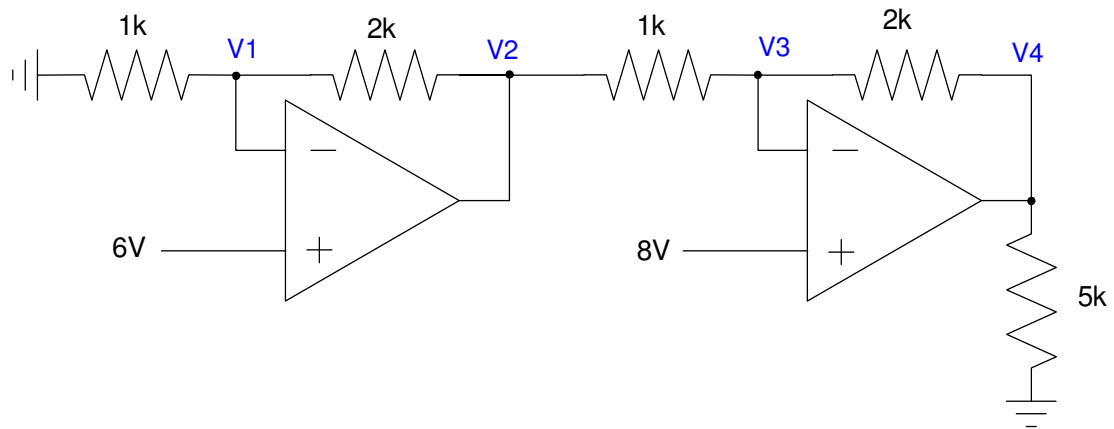$$\left(\frac{V_1}{1k}\right) + \left(\frac{V_1 - V_2}{2k}\right) = 0$$

Write the node equation at V3

$$\left(\frac{V_3 - V_2}{1k}\right) + \left(\frac{V_3 - V_4}{2k}\right) = 0$$

Problem #4: Determine the voltages and currents

Vp = Vm

Current in = Current Out