

ECE 321 - Quiz #1 - Name _____

Op-Amp Amplifiers, Push-Pull amplifiers. Due midnight, April 9th

Calculators, internet, Matlab permitted.

Please sign pledge if able (i.e. you did not work with anyone else)

No aid given, received, or observer: _____

1) Determine the voltages V_1, V_2, V_3, V_4

V_1	V_2	V_3	V_4
1.0000	0.99997	6.0232	4.00138

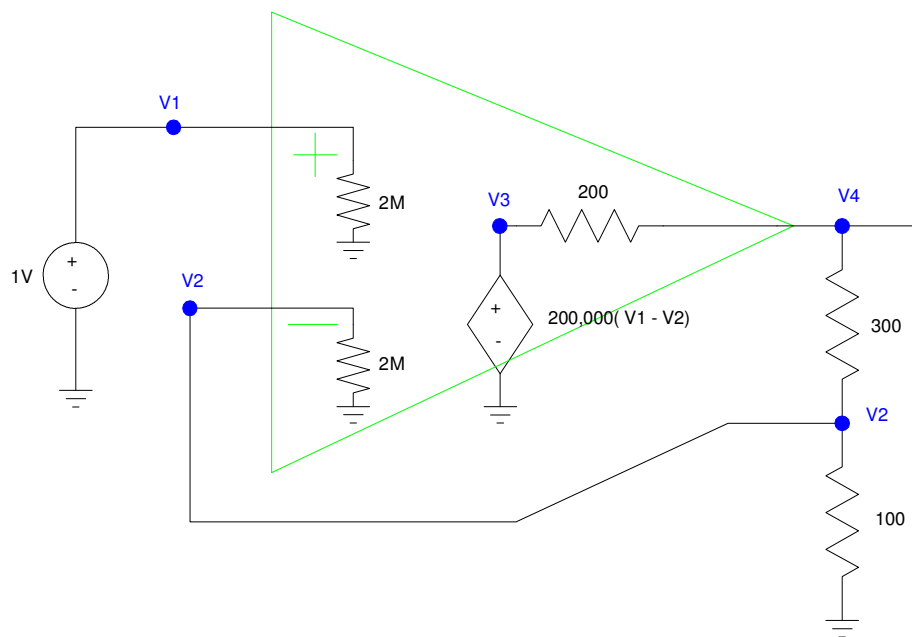
Equations:

$$V_1 = 1$$

$$\left(\frac{V_2 - V_4}{300}\right) + \left(\frac{V_2}{2M}\right) + \left(\frac{V_2}{100}\right) = 0$$

$$V_3 = 200,000(V_1 - V_2)$$

$$\left(\frac{V_4 - V_3}{200}\right) + \left(\frac{V_4 - V_2}{300}\right) = 0$$

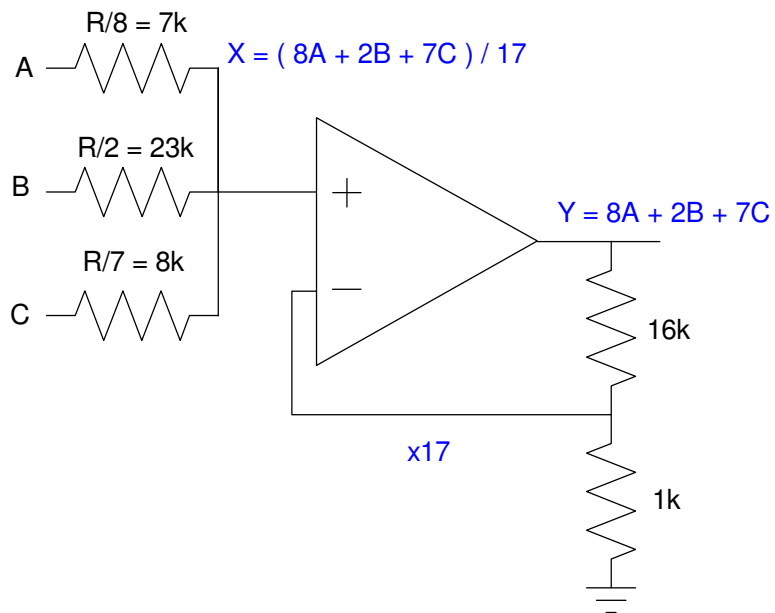


2) Assume signals A, B, C are 1Vpp signals in the range of 20-1000 Hz, capable of driving 1mA. Design an amplifier so that the output is

$$Y = 8A + 2B + 7C$$

There are multiple solutions. This is one:

Let $R = 56k$



3) Determine V_2 as a function of A , B , and C . Assume ideal op-amps

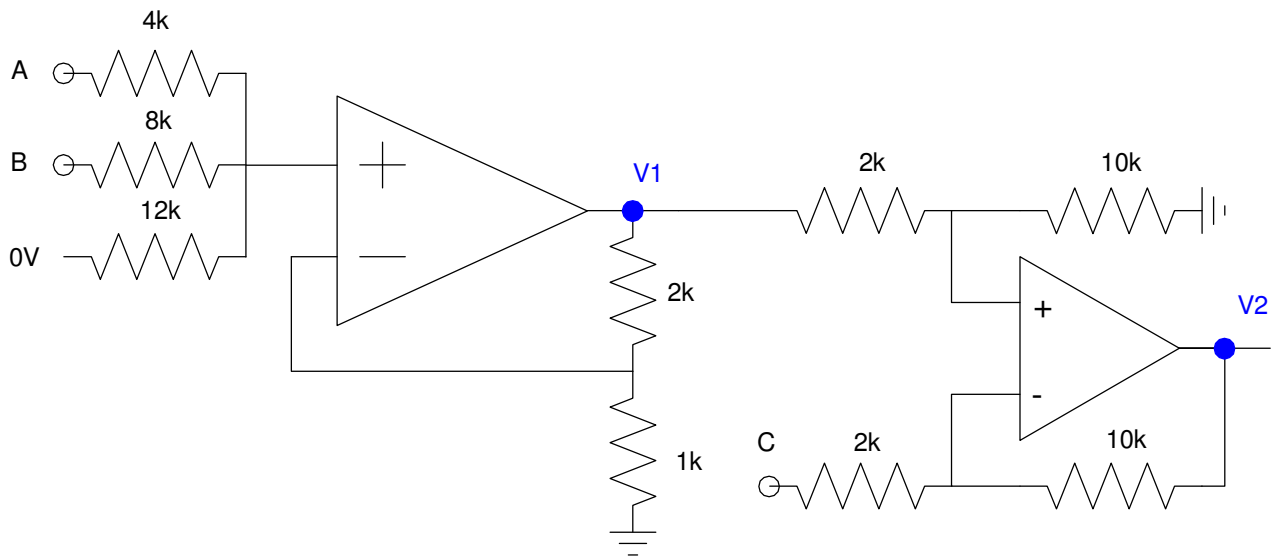
$$\left(\frac{X-A}{4k}\right) + \left(\frac{X-B}{8k}\right) + \left(\frac{X}{12k}\right) = 0$$

$$X = 0.5454A + 0.2727B$$

$$V_1 = 3X = 1.6363A + 0.8181B$$

$$V_2 = 5(V_1 - C)$$

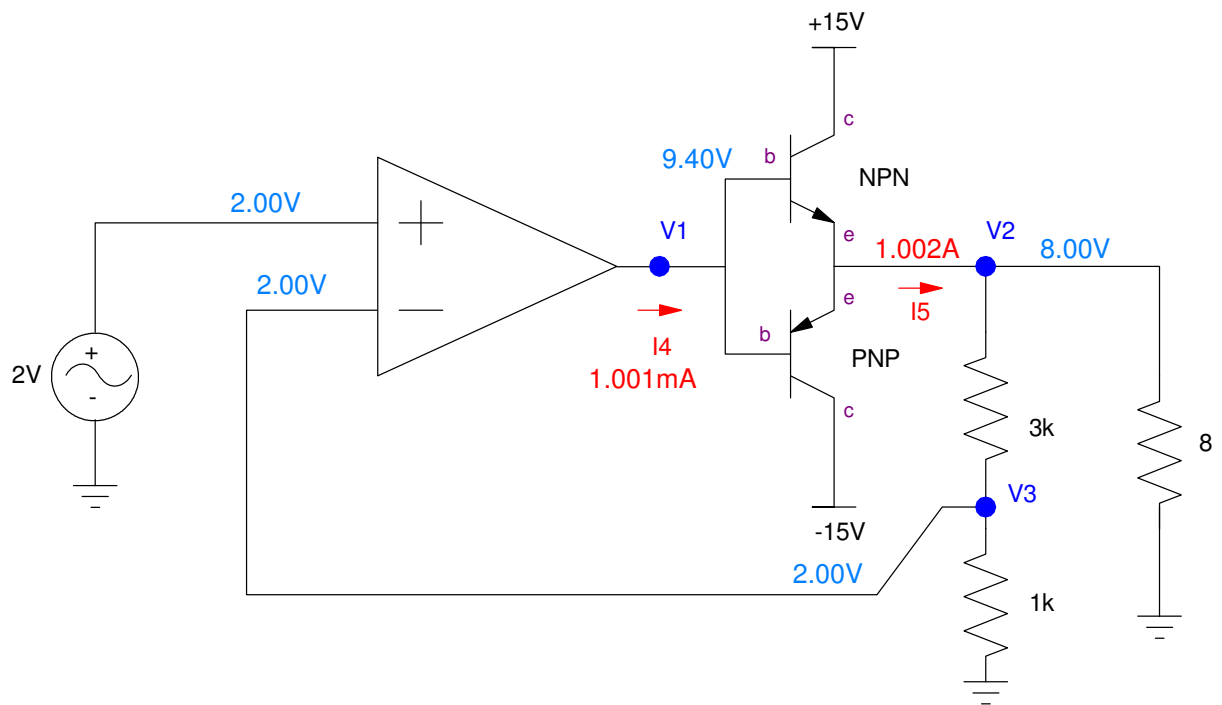
$$V_2 = 8.1818A + 4.0909B - 5C$$



4) Determine the voltages for the following push-pull amplifier. Assume TIP transistors

- $|V_{be}| = 1.4V$
- $\beta = 1000$

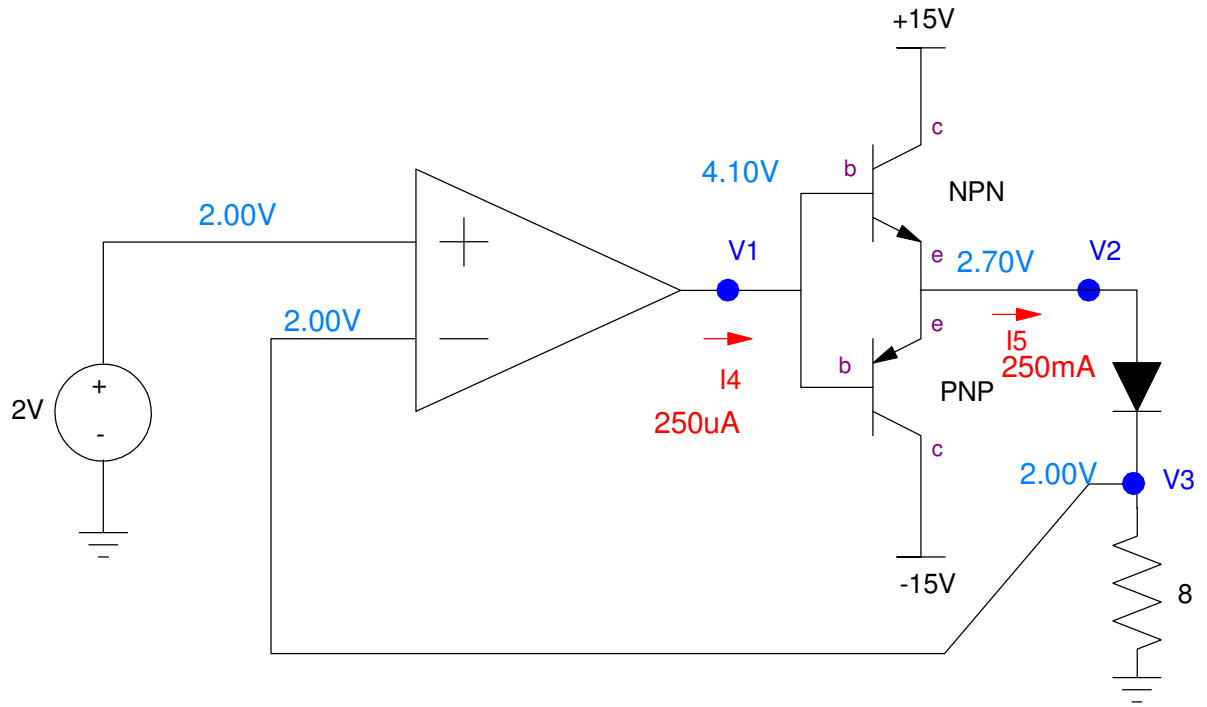
V1	V2	V3	I4	I5
9.40 V	8.00 V	2.00 V	1.001 mA	1.002 A



5) Determine the voltages for the following push-pull amplifier. Assume TIP transistors

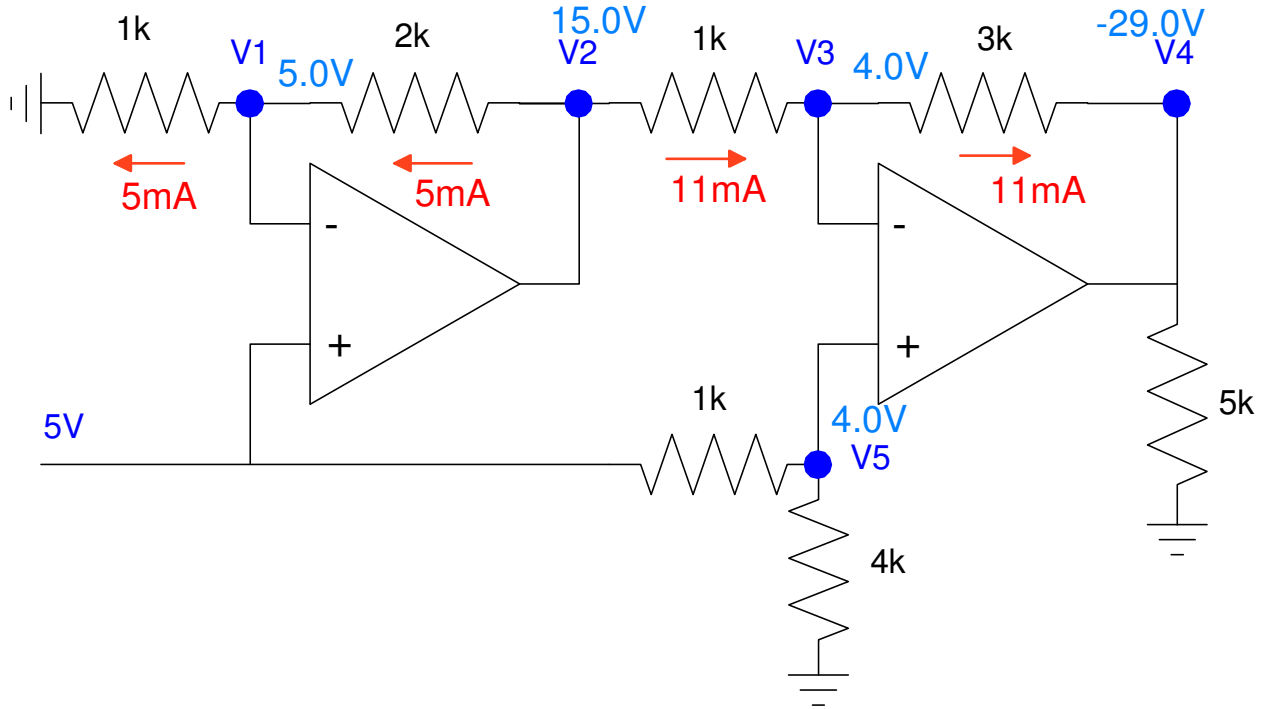
- $|V_{be}| = 1.4V$
- $\beta = 1000$

V1	V2	V3	I4	I5
4.10 V	2.70 V	2.00 V	250uA	250mA



6) Determine the voltages for the following op-amp circuit. Assume ideal op-amps

V1	V2	V3	V4	V5
5 V	15 V	4 V	-29 V	4 V



Bonus: What answer voltages does CircuitLab (or PartSim or a similar circuit simulator) give for problem #6?

V1	V2	V3	V4	V5
5.000 V	-15.000 V	4.000 V	-29.000 V	4.000 V

V(V1)	5.000 V	<input type="text"/>	<input type="text"/>
V(V2)	15.00 V	<input type="text"/>	<input type="text"/>
V(V3)	4.000 V	<input type="text"/>	<input type="text"/>
V(V4)	-29.00 V	<input type="text"/>	<input type="text"/>
V(V5)	4.000 V	<input type="text"/>	<input type="text"/>

