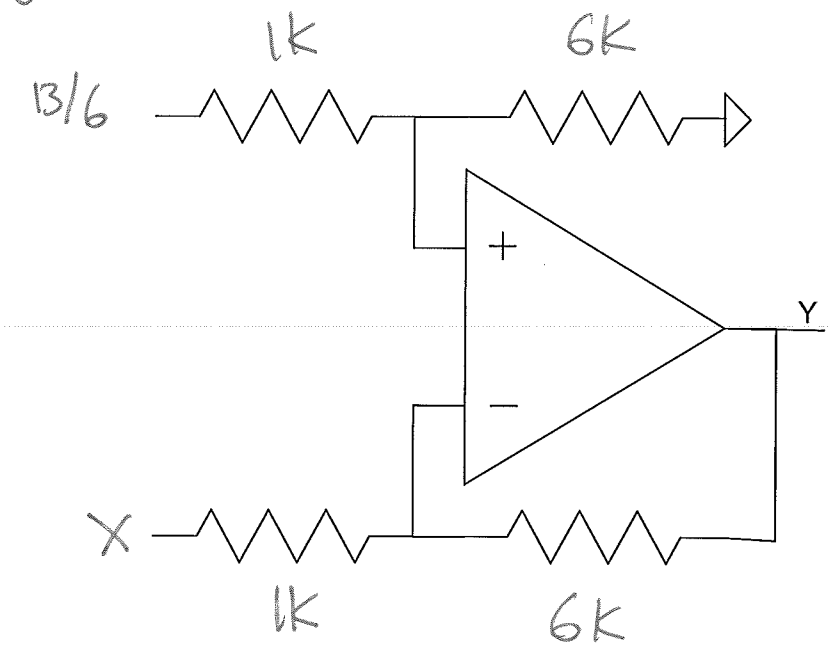
ECE 321: Quiz #1 Name _____ 9:00 / 11:00

Op-Amp Amplifiers, Push-Pull Circuits - April 6, 2017

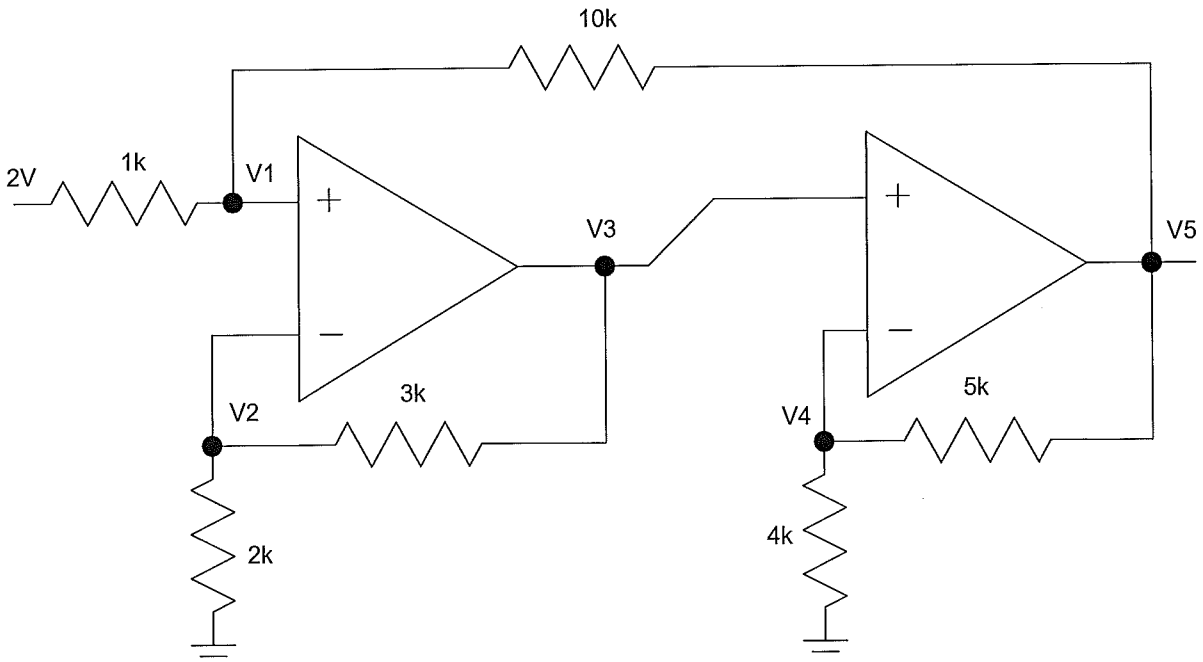
1) Design a circuit to implement the function

$y = 13 - 6x$

$y = 6\left(\frac{13}{6} - x\right)$



2) Write 5 equations to solve for the 5 unknown voltages. Assume ideal op-amps

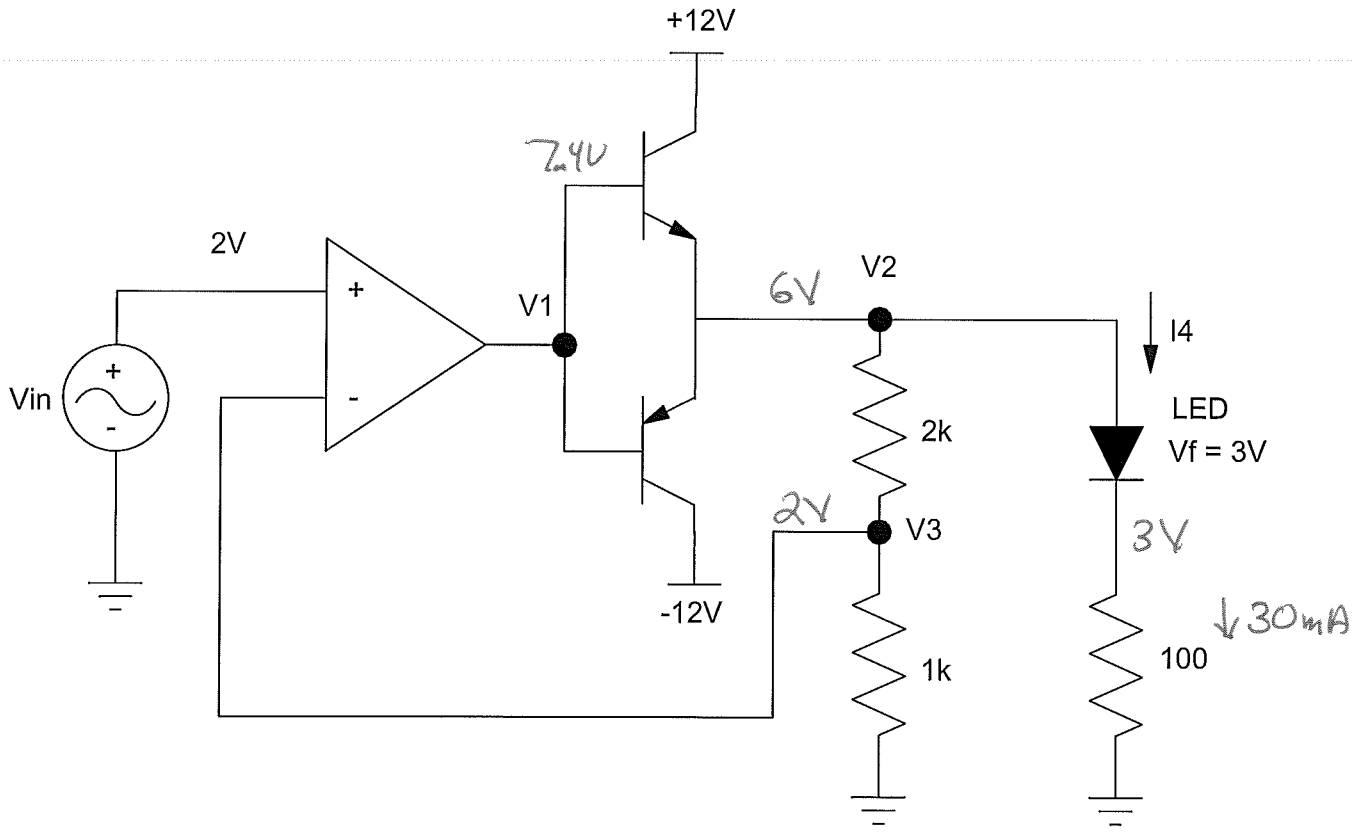


@V_3	$V_1 = V_2$
@V_5	$V_3 = V_4$
@V_1	$\frac{V_1 - 2}{1k} + \frac{V_1 - V_5}{10k} = 0$
@V_2	$\frac{V_2 - V_3}{3k} + \frac{V_2}{2k} = 0$
@V_4	$\frac{V_4 - V_5}{5k} + \frac{V_4}{4k} = 0$

3) Determine the voltages and currents for the following circuit. Assume

- Darlington pairs for the transistors: β=1000, Vbe = 1.4V
- A 3W white LED which drops 3V @ 1000mA

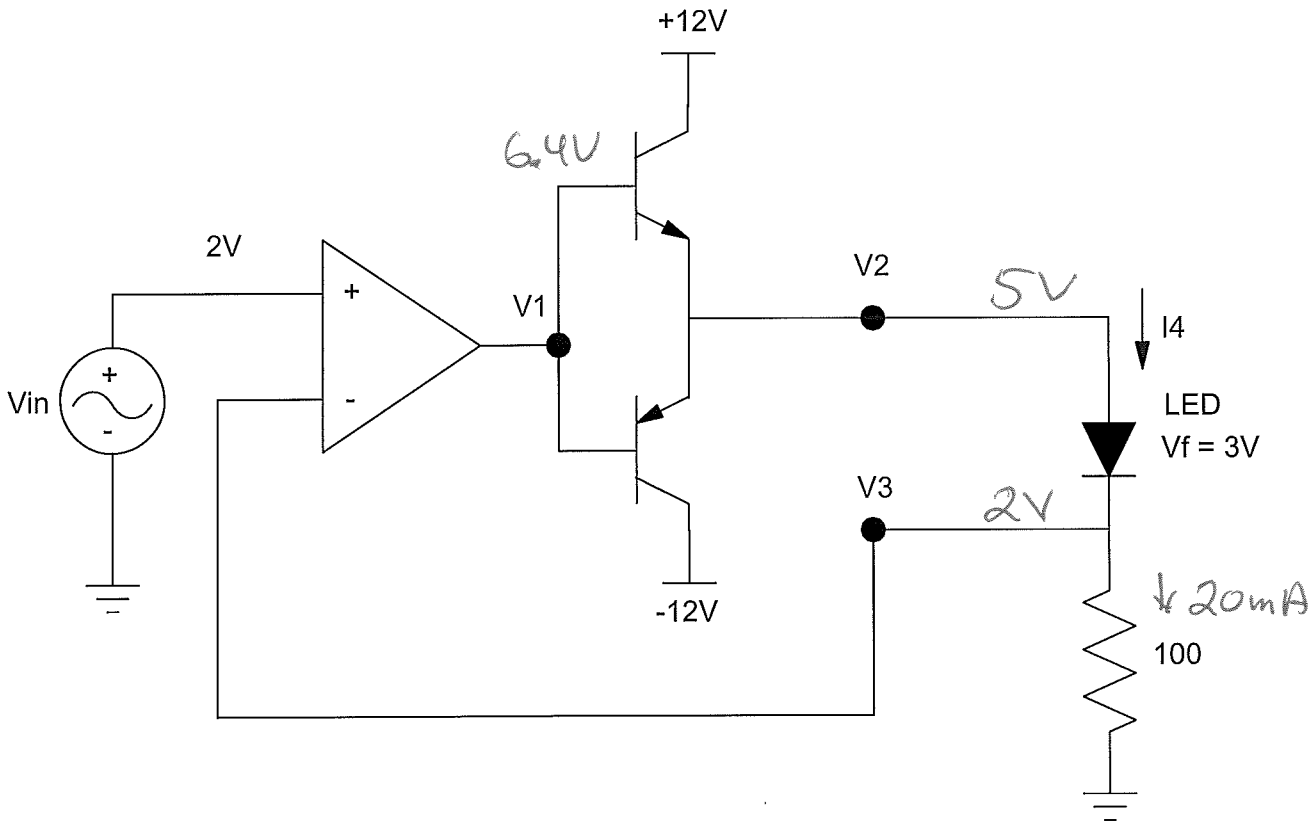
V1	V2	V3	I4
7.4V	6V	2V	30mA



4) Determine the voltages and currents for the following circuit. Assume

- Darlington pairs for the transistors: β =1000, Vbe = 1.4V
- A 3W white LED which drops 3V @ 1000mA

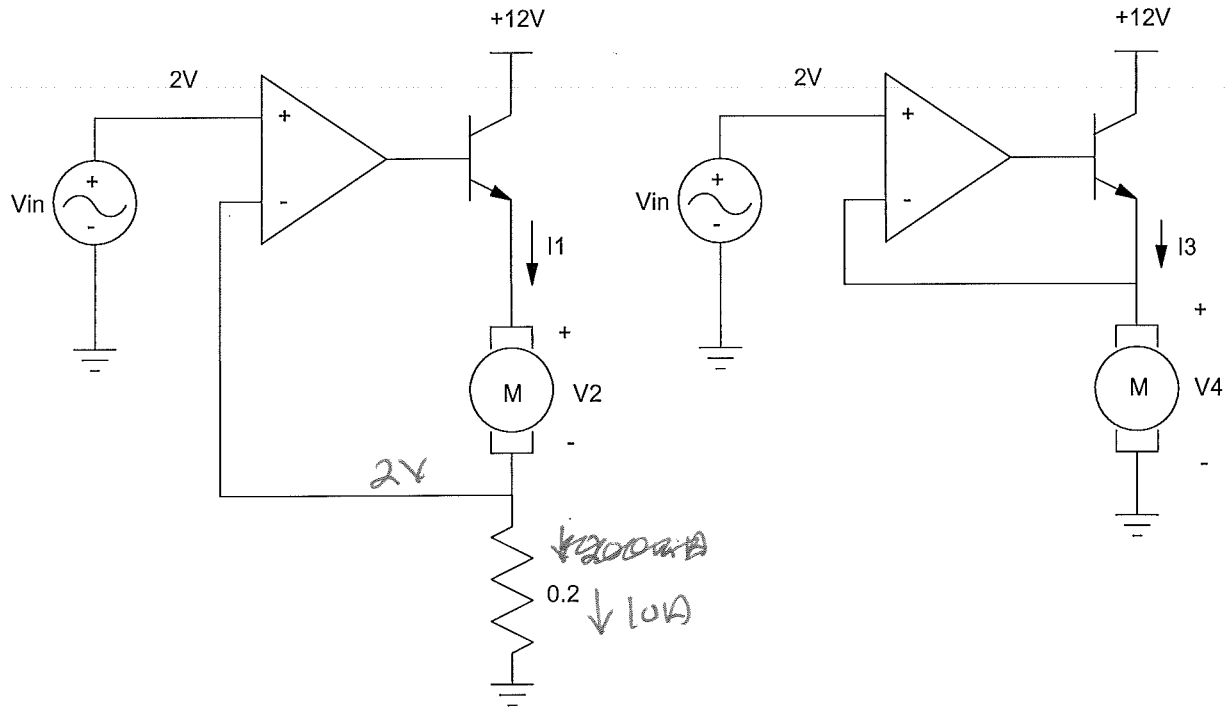
V1	V2	V3	I4
6.4V	5V	2V	20mA



5) Two different motor amplifiers are shown below. Determine the voltage and current if possible. If one is uncertain or depends upon the motor speed, put "depends" in the box. Assume transistors with

- $\beta = 1000$
- $V_{be} = 1.4V$
- $V_{ce(sat)} = 0.9V$

I1	V2	I3	V4
10A	depends	depends	2V



Bonus!!! Between 1984 and 1994, the use of seat belts while driving became required by law. What was one arguement used for why people should **not** be allowed to choose whether or not they wear their seat belts? people who wear seatbelts are subsidizing people who don't. (The cost of accidents is much more if the passengers are not wearing their seatbelts)