ECE 321 - Quiz #1. Name _____
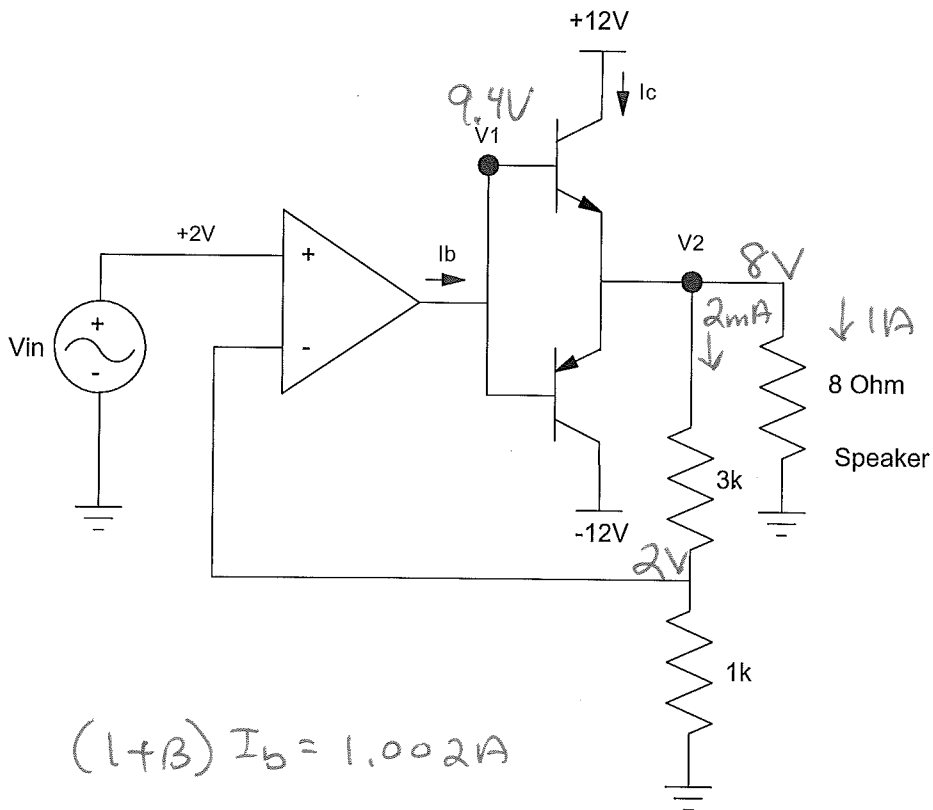
Push-Pull Amplifiers, Op-Amp Amplifiers. April 6, 2018

Push-Pull Amplifiers: Voltage Output

1) Determine the voltages and currents for the following push-pull amplifier. Assume TIP transistors with

- $\beta = 1000$
- $|V_{be}| = 1.4V$
- $|V_{ce:sat}| = 0.9V$

V1	V2	Ib	Ic
9.4V	8V	1.001mA	1.001A

$$(1+\beta)\, I_b = 1.002A$$

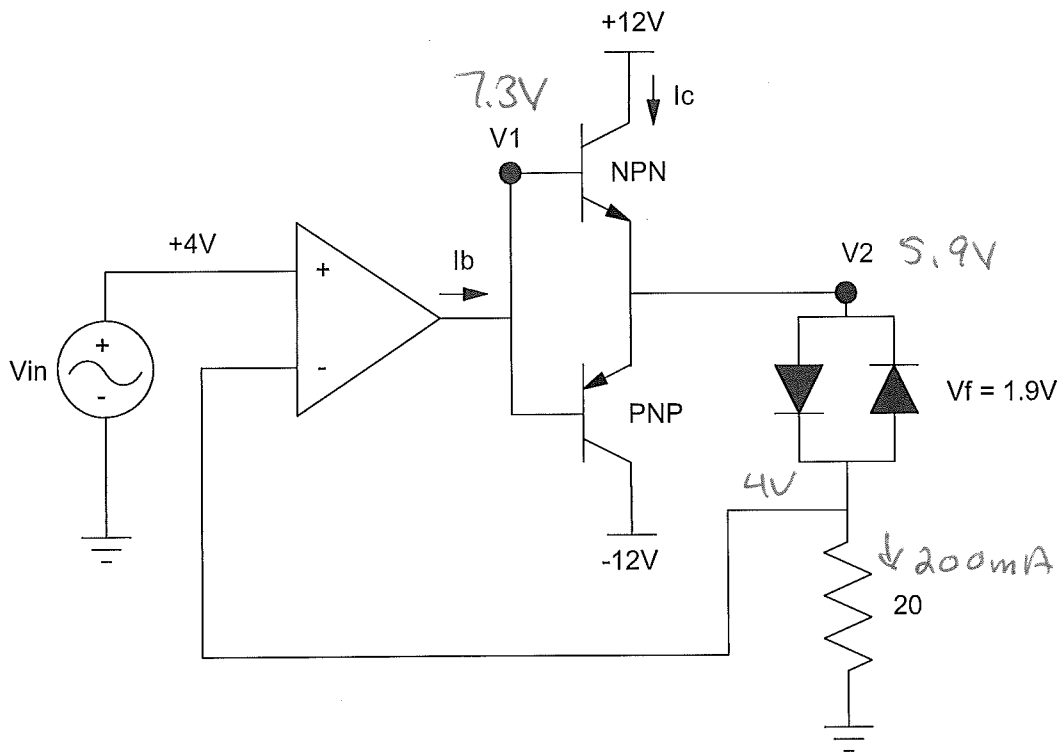$$I_b = \frac{1.002}{1001} = 1.001 mA$$

$$I_c = 1000\, I_b = 1.001A$$

Push-Pull Amplifiers: Current Output

2) Determine the voltages and currents for the following push-pull amplifier. Assume TIP transistors with

- $\beta = 1000$
- $|V_{be}| = 1.4V$
- $|V_{ce:sat}| = 0.9V$

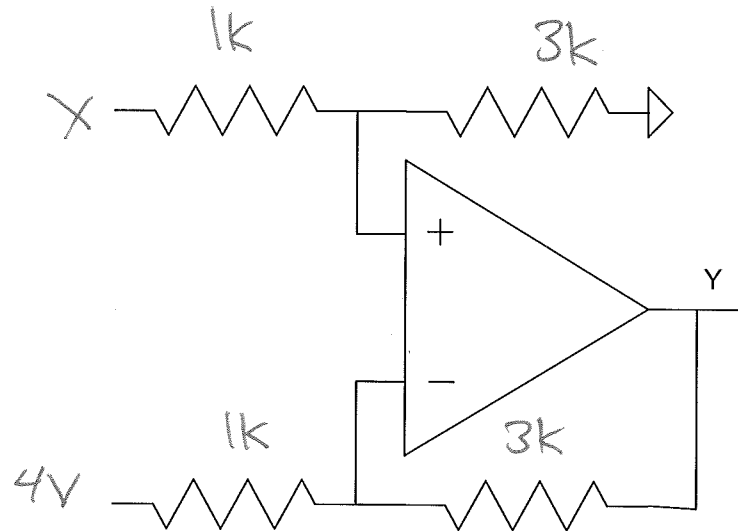| V1	V2	Ib	Ic
7.3V	5.9V	199.8μA	199.8mA

$$(1+\beta)I_b = 200mA$$

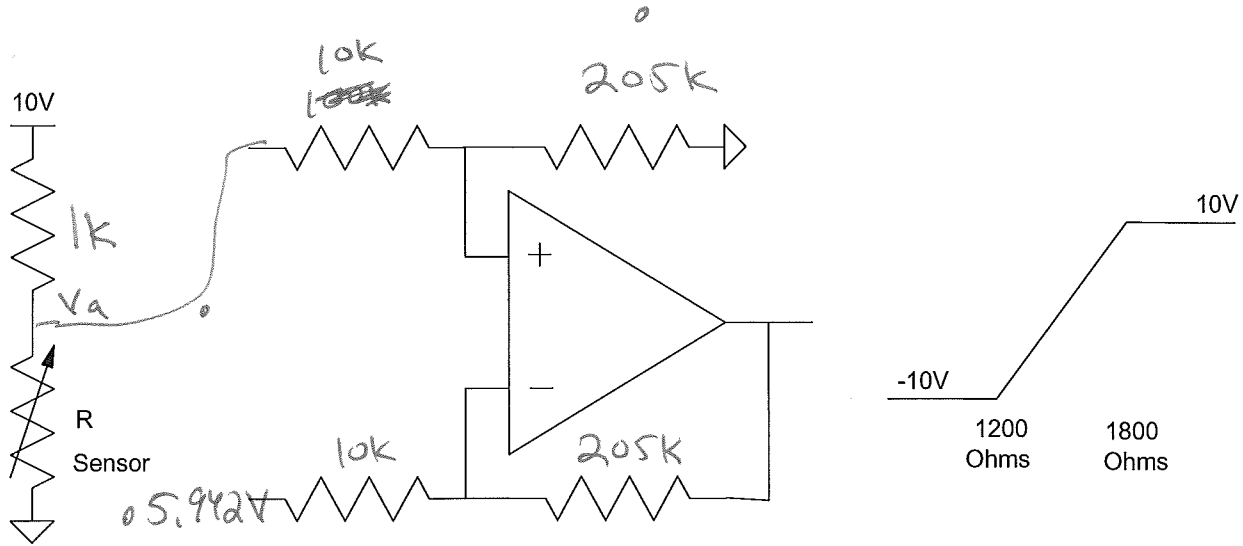$$I_b = \frac{200mA}{1001} = 199.8\mu A$$

$$I_c = \beta I_b = 199.8mA$$

3) Design an op-amp circuit which has a gain of

$Y = 3X - 12$ $= 3(x - 4)$

1k   3k

X ⎓〜〜〜〜⎓〜〜〜〜▷

+

Y

−

1k   3k

4V ⎓〜〜〜〜

4) Design a circuit which outputs
- -10V when R = 1200 Ohms
- +10V when R = 1800 Ohms
- Proportional for 1200 < R < 1800 Ohms

$1200\,\Omega$

$V_a = 5.45\,V$

$V_0 = -10V$

$1800\,\Omega$

$V_a = 6.429\,V$

$V_0 = +10\,V$

$$y = gain = \frac{10 - (-10)}{6.429 - 5.45} = 20.53$$

$$y = 20.53(V_a - V_b)$$

@ $1800\,\Omega$

$$10 = 20.53\left(6.429 - V_b\right)$$

$$V_b = 5.942\,V$$

gain = 03

5) Write the voltage node equations for the following op-amp circuit

$+4V-$

$6V$

1k   V1   2k   V2   3k   V3   4k   V4

2mA   2mA

2V

2V

3mA

1mA

3V

3V

16mA

$-1V$

16mA

$V_1 = 2$
$V_3 = 3$
$\dfrac{V_1}{1k} + \dfrac{V_1 - V_2}{2k} = 0$
$\dfrac{V_3 - V_2}{3k} + \dfrac{V_3 - V_4}{4k} = 0$

born Sept 8, 1941

Godzilla, King of the monsters (1954)

Bonus! Which is older: Bernie Sanders or Godzilla? (i.e. were any Godzilla movies made at the time Bernie Sanders was born?)