ECE 321 - Homework #1

Push-Pull Amplifiers, Instrumentation Amplifiers, Active Filters. Due Wednesday, April 4th, 2018

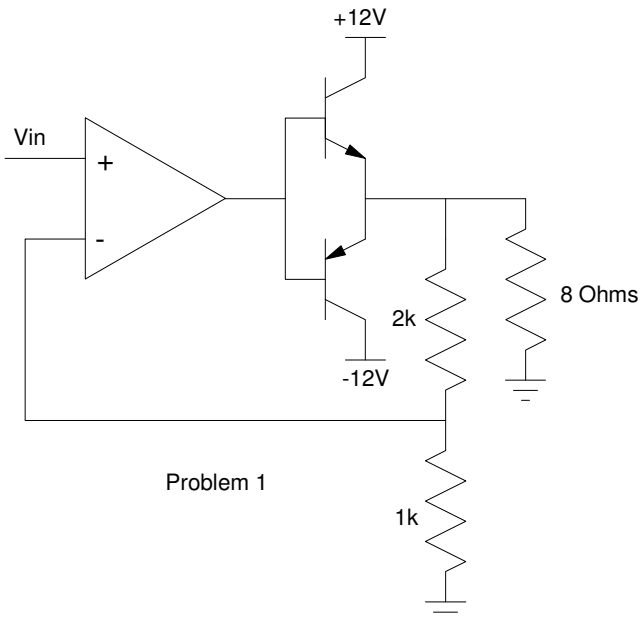
For all circuits, assume TIP112 (NPN) and TIP117 (PNP) transistors

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

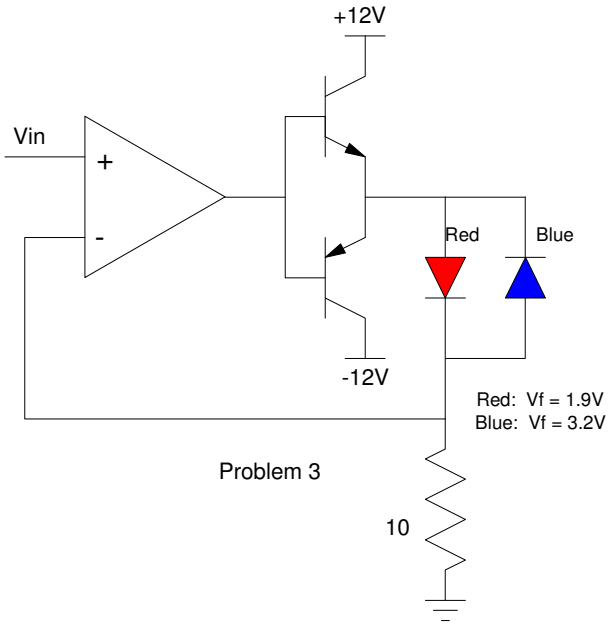
Push-Pull Amplifiers

1) Determine the voltages and current for the following push-pull amplfiier with
   - Vin = 2V
   - Vin = -2V
2) Verify your design in PartSim

3) Determine the voltages and current for the following push-pull amplfiier with
   - Vin = 2V
   - Vin = -2V



Problem 1



Problem 3

Op-Amp Circuits:

4) Design an op-amp circuit to implement the funcitons
   - Y = 4X
   - Y = -4X
   - Y = 4X - 12

A light sensor has the following light / resistance relationship:

$$R = \frac{100{,}000}{Lux}\ \Omega$$

5) Design an instrumentation amplifier whose output is

- 0V when the light level is 50 Lux
- 10V when the light level is 100 Lux

6) Design an instrumentation amplifier whose outout is

- -10V when the light level is 50 Lux
- +10V when the light level is 100 Lux

Op-Amp Circuits

7) Assume ideal op-amps

- Write the voltage node equations for the following op-amp circuits
- Solve for the voltages V1 .. V4