ECE 321 - Homework #1

revised: November 4, 2021

Op Amp Amplifiers, Push-Pull Amplifiers. Due Monday, November 8th

Please make the subject "ECE 321 HW#1" if submitting homework electronically to Jacob_Glower@yahoo.com (or on blackboard)

For all problems, assume you are using
- MCP602 Op Amps (max current = 50mA)
- 2SC6144 transistors (β = 200, 10A max, |Vbe| = 0.7V

Amplfier:

Design a circuit to implement

1a) Y = +3X

1b) Y = -3X

1c) Y = 12 - 4X

Mixer

2) Design a circuit to mix three signals together:
- Y = 6A + 1B + 3C
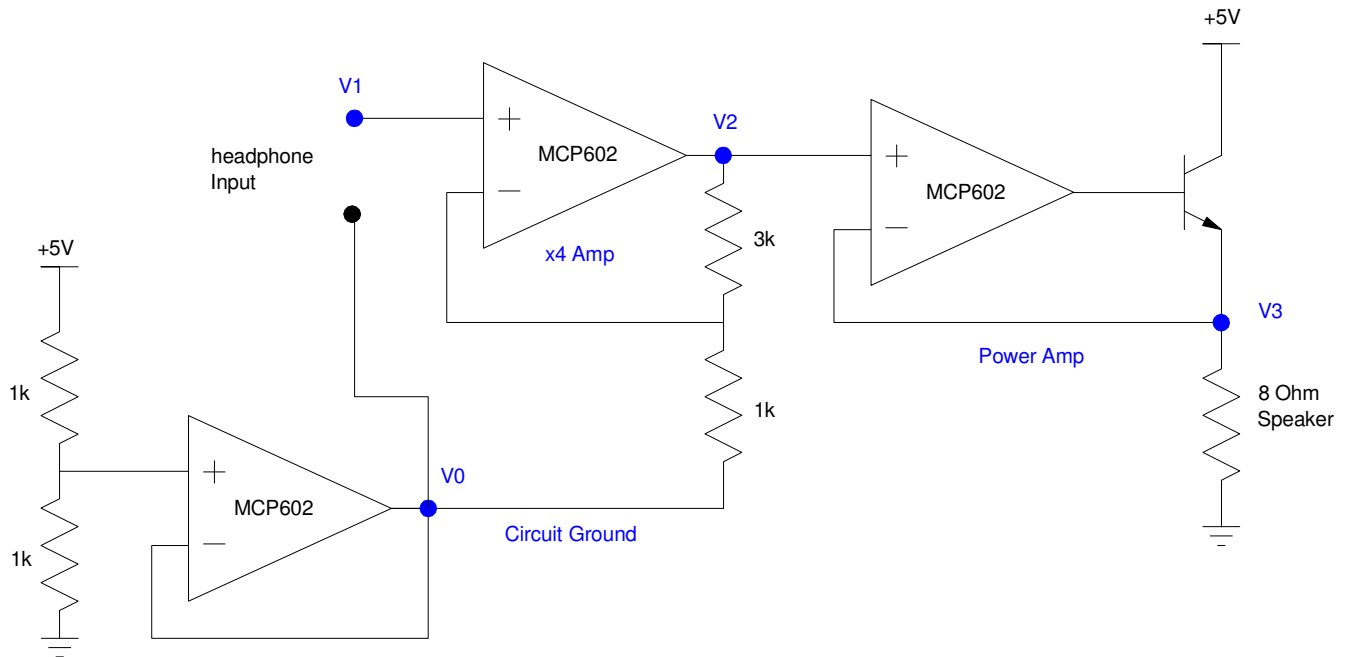
Push-Pull Amplifier

3) Design a circuit so that Y = X
- X = -5V to +5V, 10mA max
- Y = -5V to +5V, 200mA (25 ohm speaker (net))

4) Simulate in CircuitLab

Lab (Hardware)

The following circuit
- Creates a 2.5V power supply from a single +5V supply (V0). This 2.5V supply then acts like circuit ground
- Amplifies the output of a cell phone (or computer or 555 timer) (V2), and
- Drives an 8 Ohm speaker (V3)

5) Calculate the voltages and currens when
- V1 = 1.5V
- V1 = 2.5V
- V1 = 3.5V

6) Simulate this curcuit in CircuitLab with
- V1 = 1Vpp, 1kHz sine wave

7) Build this circuit in hardware. With a sine wave input, (1kHz) verufy that that
- V2 = 4*V1   (relative to circuit ground)
- V3 = V2   (relative to circuit ground)

8) Demo
- Replace V1 with an audio signal and verify the song plays on the speaker