ECE 321 - Homework #1

Instrumentation Amplifiers, Push-Pull Amplifiers. Due Monday, November 6th, 2017

1) Design a circuit to imlement the function

a) $Y = 3X$

b) $Y = -3X$

c) $Y = 3X - 4$

2) An A/D converter on a microcontroller requires a 0..5V signal. Design a circuit which converts -10V..+10V to 0..5V.

3) The output of a D/A converter is 0..5V. Design a circuit to convert this to -10V..+10V

Requirements:

- Input: -10V .. +10V capable of 20mA
- Output: 8 Ohm speaker
- Relationship: Y = X
- Tolerance: Y = X +/- 0.2V

4) Analysis: Design a push-pull amplifier which meets the above requirements. Compute the voltages and currents at

- Vin = -10V DC
- Vin = +10V DC
- Vin = +1V DC

(check the two endpoints and one or two points inbetween)

5) Simulation: Check your analysis using PartSim. Verify its operation at

- Vin = -10V DC
- Vin = +10V DC
- Vin = +1V DC

6) Validation: Build the push-pull amplifier and verify its operation at

- Vin = -10V DC
- Vin = +10V DC
- Vin = +1V DC

Note: Save your circuits. We'll be using them in the following weeks.