303H Fall 2016 – Homework 4 Due Tu 10/11/16
For the following problems assume a 9Volt battery available.

1. (50 points, BJT CE design)
    a) Design a common emitter amplifier using a 2N3904 transistor for a voltage gain of Av=-20 with the collector current near 10mA.
    b) Check your design by running Spice with sinusoidal input signals at a frequency near 10KHerz. .
    c) In Spice do a frequency response, looking at magnitude and phase from 10Hz to 1GHerz (on a log of frequency scale) and comment on the results.

2. (50 points, current mirrors)
    For transistors use 2N3904, 2N3906, and BiCMOS12 0.5u transistors
    a. Using resistors and transistors design four current mirrors to mirror 10mA, two for sinking and two for sourcing, one of each of these two using BJTs.
    b. Repeat but for 10uA using CMOS.
    c. Check your designs in Spice by placing a resistor load on an output transistor and comment upon what values of the load the circuit acts as a valid mirror.
    d. By replacing the current determining resistor by a PMOS transistor, repeat the above two parts for the current sinking MOS mirror.
    e. Repeat part c. for a CMOS sink made as a cascade.