Physics 517/617 Experiment 3
Diodes and Op Amps I

Due midnight July 26

Useful reading: Practical Electronics for Inventors pp 406-407, 425-426, Chapter 7

Basic Experiment - Physics 517/617

1) Build a clipping circuit that limits the voltage swing from -0.6 to 3 Volts. Use a 1 KΩ input resistor. Apply a 1 KHz sine wave. Vary the amplitude of the input voltage and sketch the input and output waveforms. What happens when one applies a triangular wave?

2) Build a full wave rectifier. Plot the output voltage vs. input voltage. Make a modification so that the output voltage approximates D.C.. Use a transformer to couple the input voltage to your circuit. What is the ripple factor both measured and expected for your circuit? Note: if the ripple is too small to be measured, increase the load to where you can measure something.

3) Design and measure the transfer function (magnitude and phase vs. frequency) for two non-inverting amplifiers with gains of 10 and 20. Make a measurement at DC and scan the frequency range from 10 Hz (or as low as you can go on your function generator) to 1 MHz. Record AC measurements on Bode plots. Discuss and compare the two amplifiers: note especially the differences in the frequency responses.

4) Build a summing amplifier with two inputs, $V_A, V_B$, such that $V_{out} = -(2V_A + 3V_B)$. Test your summing amplifier with DC voltages. Drive it with two sine wave inputs that are near in frequency and demonstrate “beating.”

Additional for 617/extra credit

5) Measure and compare in detail the I-V characteristics of a diode in the lab to the theoretically predicted dependence:

$$I = I_0 \left( e^{V/kT} - 1 \right).$$