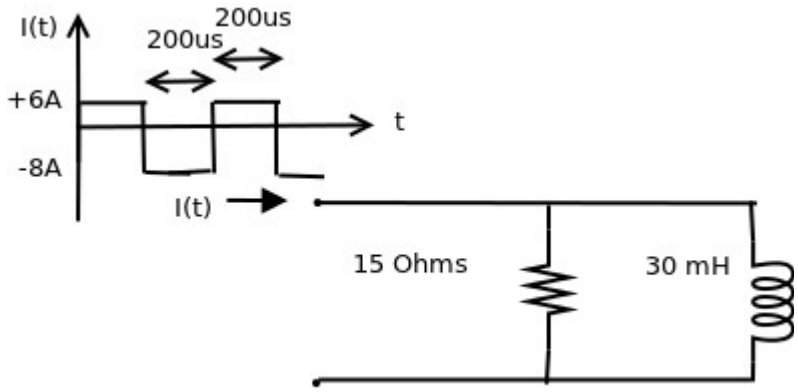
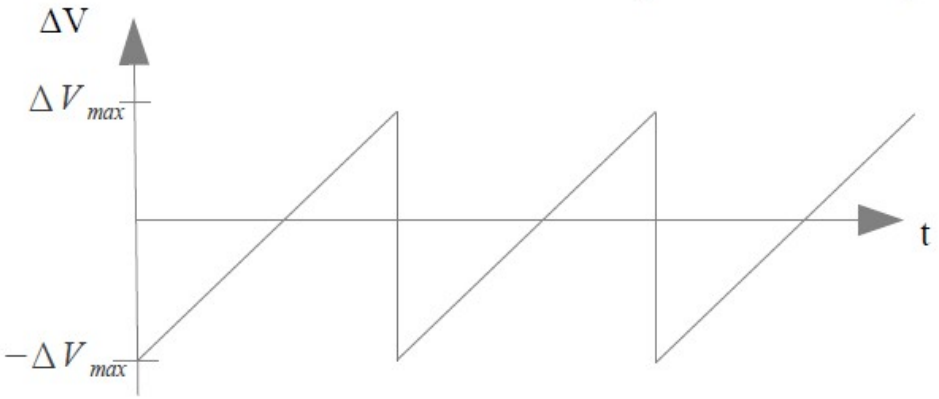
Phys 2201 Electricity and Magnetism
Homework #18 – Due Mar. 22, 2016 by 3pm
(hand in to drop box outside 3L24)

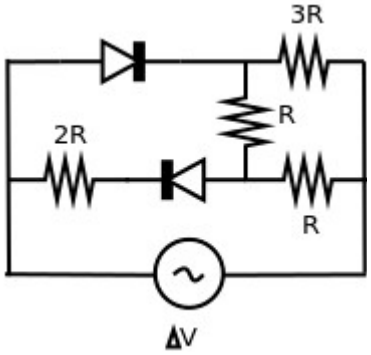
1. An current square wave with period 400 μs, that goes to +6 A and down to -8 A is applied to the circuit below. What is the Emf across the inductor as a function of time for the first upswing and downswing? Plot or sketch the curve, and derive Emf(t) for the first upswing and downswing of the current. Assume that the initial current in the inductor is -1.35 A.



2. Show that the RMS value of the saw-tooth voltage shown in the figure below is $\Delta V_{max}/\sqrt{3}$.



3. Find the average power delivered by the power supply in terms of the AC voltage amplitude ΔV and R for the circuit below.



4. A 6.5 μF capacitor is charged by a 24 V DC power supply. The fully charged capacitor is then discharged through a 2 mH inductor. Find the maximum current in the resulting oscillations.

5. In the RLC circuit below, the switch has been in position 'a' for a long time. (a) Find an expression for the charge as a function of time on the capacitor when the switch is flipped to position 'b', when R=18 Ohms, L=5.8 mH, and C=2.20 μF, and V=8.0 V. (b) Plot or sketch the charge versus time. (c) What value of R should be chosen to give critical-damping?