

## Physics 321: HW 4

Problems 3.13, 3.16, 3.18, and 4.1 in Sprott.

**Due to the exam on October 5<sup>th</sup>, this HW will be due Tuesday, Oct 10<sup>th</sup>. (But note that HW 5 will still be due Oct 12<sup>th</sup>.)**

### Hints:

In problem 3.13, start out by using Kirchhoff's laws to write two loop equations and one node equation. Differentiate as necessary to combine them into a differential equation for the current in the resistor.

In problem 3.16, note that after the switch is closed, the circuit can be drawn as three independent loops.

In problem 4.1, the inhomogeneous solution was worked out somewhat laboriously in Sprott section 4.2 (we will soon learn a much easier way to solve problems like this in frequency domain). In section 4.2, they ignored the homogenous part of the solution and the initial conditions, saying we'd just wait for this to die out ( takes only a few times RC seconds). In 4.1, you want the entire solution from  $t=0$ . Since you already have the inhomogeneous part, you just need to figure out the homogeneous solution (which is  $I_1 \exp(-t/\tau)$ ) and get the value of  $I_1$  that matches the boundary conditions.