PHYS 4211 Instrumentation HW 1.

TE Coan
Spring '16

1. Redraw the circuit shown in Figure 1 so that it looks like the circuit shown in Figure 2. The *functionality* of both circuits must be identical. This means that the voltage drop across R_L should be the *same* in both circuits and that the current flowing through R_L should be the *same* in both circuits. Hence, express V_{th} and R_{th} in terms of V_0 and R_1, R_2. Figure 2 is called the *Thévinin equivalent* of Figure 1 and the general technique is used to reduce a potentially very complex circuit into a simpler one.

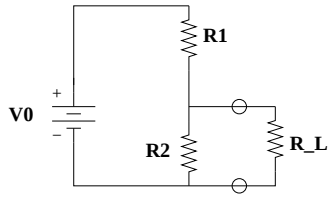

Figure 1: Original circuit.

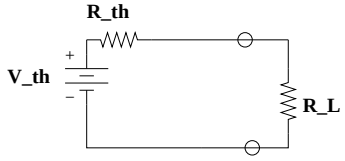

Figure 2: Thévenin equivalent circuit.

2. Horowitz & Hill, problem 7, page 59.

3. Plot the frequency response (i.e., V_{out}/V_{in} versus f) characteristic of a high-pass RC filter for $R = 10^6\,\Omega$ and $C = 0.01\,\mu$F. Cover the frequency interval from two decades (a "decade" is a power of ten) below $f_{3\,\mathrm{dB}}$ to two decades above it. Do not be afraid to use a plotting package like gnuplot. (Other plotting routines are fine.)