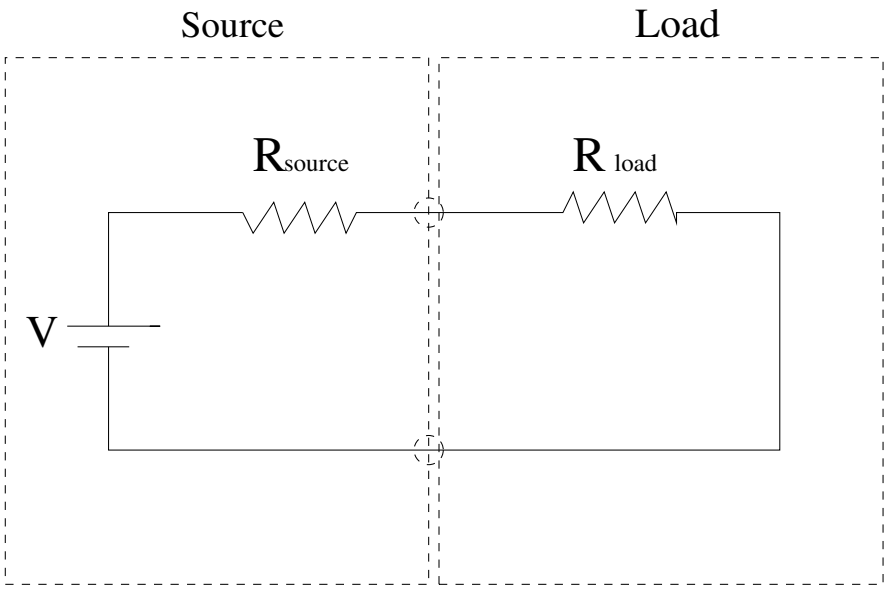
Homework #3

due Thursday February 15

1. Hirose and Lonngren Chapter 1 #12
2. Tipler and Mosca Chapter 29 #81 Also, draw a phasor diagram.
3. Tipler and Mosca Chapter 29 #70
4. Tipler and Mosca Chapter 29 #99
5. Consider our typical block-on-spring-on-plane, but imagine that it is being driven by a sinusoidally varying force, $F = F_0 \cos \omega t$. Assume there is a damping term that is proportional velocity, i.e. $b\frac{dx}{dt}$. Set up the differential equation and solve for the amplitude of oscillation. Describe in words how the amplitude varies with frequency. *(Hint: I solved this exact same equation in class on Feb 8, except for an LRC circuit. The math is the same, the constants are the only things that are different. If you follow your notes, it should be straightforward.)*
6. *"Impedance matching"* Any time you want to transfer electrical power from a source to a load, it is advisable to make sure that the impedances of the source and the load are as close to being equal as possible. This maximizes the power transfer and minimizes reflections from the load. (We will talk about reflections later in the course.) Show that you get the maximum power transfer between a source and a load when the impedances are matched. *(Hint: Use the figure on the next page, where R_{source} represents the impedance of the source and R_{load} represents the impedance of the load. Write an expression for the power at R_{load} in terms of the current. Then plug in an expression for the current. Assume R_{source} is fixed and find what value of R_{load} maximizes the power.)*


Source
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