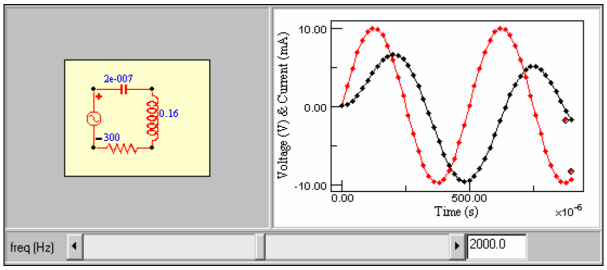
Worksheet for Exploration 31.7: RLC Circuit



Assume ideal components. The graph shows the voltage across the source **(red)** and the current from the source **(black)** as functions of time **(voltage is given in volts, current is given in milliamperes, and time is given in seconds)**. Restart.

An RLC circuit is similar to an oscillating spring or child on a swing. If you push the swing at exactly the same frequency as the natural frequency of oscillation (the most common way to push a swing), it quickly goes higher and higher. But if you push (or pull) part way through the swing at times that do not match the natural rhythm of the swing, the swing will not go as high as quickly and might even swing lower (in a fairly jerky fashion). When the current is the largest, this is called the resonance.

a. What is the resonant frequency of this circuit?

i. (Adjust the frequency and determine where the current is the largest.)

Resonant frequency = __________

b. As you move the frequency of the driving source closer to the natural frequency of oscillation, what happens to the voltage and current?

i. Natural frequency of the circuit is $(1/2\pi)(1/LC)^{1/2}$.

c. Pick a new value for the variable resistor. What is the resonant frequency of this circuit?

R = _________

Resonant frequency = __________

d. What are the differences in the resonances with different values of R?

e. Compare the resonant frequency to $(1/2\pi)(1/LC)^{1/2}$. It should be the same.