# ECE 109L - THE VERY BASICS - LAB 7
# KIRCHHOFF'S CURRENT LAW

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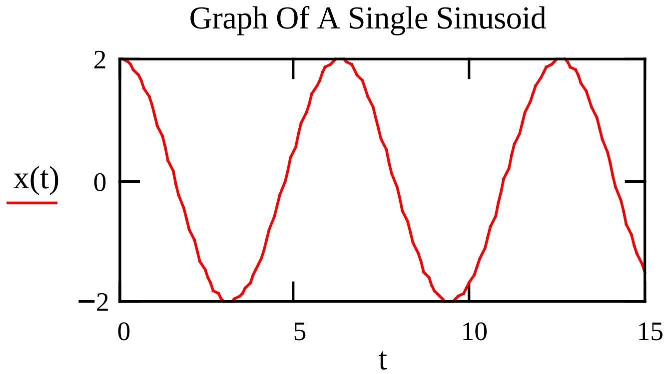
## OBJECTIVE

The objective of this lab is to verify Kirchhoff's Current Law for some simple resistor circuits.

## LAB

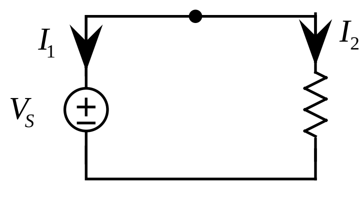
1. **Prelab** - First open the Graphing Palette by double clicking on the corresponding icon in the Math Palette. Then run and make a copy of the following Mathcad program for graphing a function.

t := 0, 0.1 . . 15
x(t) := 2*cos (t + 1.2)



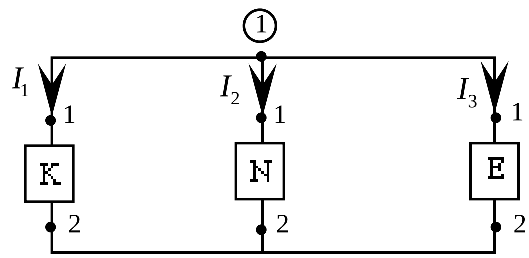

   1. To obtain the graph of x(t)
      a. Click on the x-y plot icon in the Graphing Palette
      b. Use the tab to move from one location to another as you type the parameters x(t), t, . . .
      c. Click anywhere outside the frame of the graph
      d. You can now go in and change the values over which t and x(t) are plotted
   2. Resize a graph by first selecting it and then holding down the mouse button as you drag along one of the highlighted dots
   3. Change the *format* of a graph by first double clicking on it. You can then change its color, choose solid or dashed lines and so on. You can also change the title by clicking on *labels*

2. From Lab 5 we know that the currents in simple resistor circuits like the following

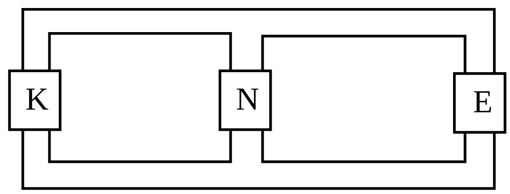



satisfy $I_1 = -I_2$ and so add up to zero with $I_1 + I_2 = 0$. The objective of this lab is to demonstrate that the sums of currents "leaving" nodes always add up to zero

Put together the following circuit on your resistor box




a. **PreLab** - Redraw the circuit with current meters inserted for measuring $I_1$, $I_2$ and $I_3$ and with the numbers 1 and 2 showing how the circuit is connected together
b. Measure the currents $I_1$, $I_2$ and $I_3$
c. Now redraw the circuit as follows




and make use of your results in part (b) to indicate which way the equivalent positive charges are flowing through each of the wires
d. Find the rate at which equivalent positive charges are entering node 1 in coulombs/sec
e. Find the rate at which equivalent positive charges are leaving node 1 in coulombs/sec
f. What do your results in parts (d) and (e) imply about the rates charges are entering and leaving node 1

3. Verify Kirchhoff's Current Law for the following circuit - that the *algebraic sum* of the currents adds up to zero. As always be sure to draw the circuit, record your measured values and draw a conclusion from your results.