

ECE 109L - THE VERY BASICS - LAB 7

KIRCHHOFF'S CURRENT LAW

SUMMER 2007

A.P. FELZER

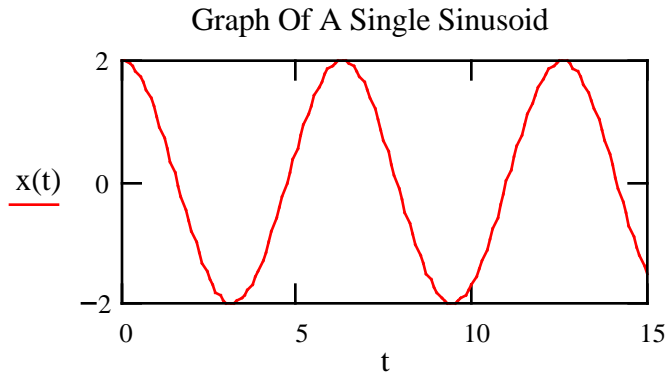
OBJECTIVE

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

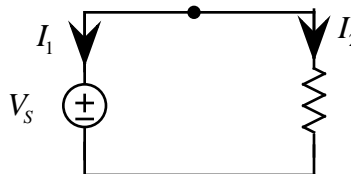
LAB

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)
```

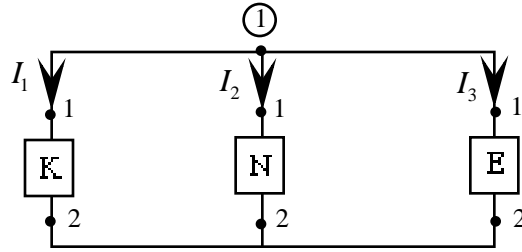


1. To obtain the graph of $x(t)$
 - a. Click on the x-y plot icon in the Graphing Palette
 - b. Use the tab to move from one location to another as you type the parameters $x(t)$, t , . . .
 - c. Click anywhere outside the frame of the graph
 - d. You can now go in and change the values over which t 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

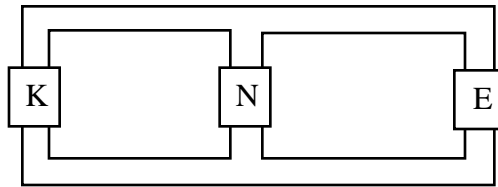


satisfy $I_1 = -I_2$ and so add up to zero with $I_1 + I_2 = 0$. The objective of this lab is to demonstrate that the sums of currents "leaving" nodes always add up to zero

Put together the following circuit on your resistor box



- 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
- Measure the currents I_1 , I_2 and I_3
- 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

- Find the rate at which equivalent positive charges are entering node 1 in coulombs/sec
 - Find the rate at which equivalent positive charges are leaving node 1 in coulombs/sec
 - What do your results in parts (d) and (e) imply about the rates charges are entering and leaving node 1
- What does your result in Problem (2) imply about the sum of the currents when all the reference arrows are pointing away from a node. Explain
 - 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.

