10/14 In Class – Saving and Loading Data and a review of Kirchhoff's Laws

Today we learned how to save and load data from files.

1. Saving, then loading and reading one variable.
   (a) Define a variable A as a matrix
   $$A = \begin{bmatrix} 0 & 1 \\ 1 & 2 \end{bmatrix}$$
   (b) Save it as a text file called `myData.txt`
   (c) You can view the text file in the editor. Do that now.
   (d) Type `clear` in the command window, and check to see that no variables are defined.
   (e) Load the data from the file you just created into a variable called B. Show me B.

2. Make three row vectors. Make them easily recognizable, something like,
   ```
   >> x = 1:5
   >> y = 2*x
   >> z = 3*x
   ```
   or something like that. Write them out to a text file. Clear the workspace, then load the file, and extract them back out.

3. Take the same three vectors, but now make them column vectors. Write them out to the file. Look at the file in the editor. Is this what you expected? Could you extract them from this file if you loaded the file? Can you think of a way to write them to the file as three columns rather than one? Do that. Write the file. Look at it in the editor. Clear your workspace. Then load the file and extract the three column vectors.

4. I made a file called `mysteryData.txt`
   Download it (or cut and paste, though it's fairly long), and see if you can figure out what the data is. Make a plot of something to convince me you know. Show me the plot.

To do Kirchhoff's Laws, we want some matrix multiplication. I got the impression on the exam that we need a matrix multiplication review: Do these all on the whiteboard first, then check your answers in MATLAB:

5. Do parts (a)-(d) on whiteboard first, then check in MATLAB. For the following parts, use,
   $$A = \begin{bmatrix} 0 & 1 \\ 1 & 2 \end{bmatrix} \qquad B = \begin{bmatrix} 3 & 4 \\ 5 & 6 \end{bmatrix} \qquad \vec{a} = \begin{bmatrix} 1 \\ 0 \end{bmatrix} \qquad \vec{b} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$
   (a) Find Aa
   (b) Find Ab
   (c) Find AB
   (d) Find BA

6. Do parts (a)-(d) on whiteboard first, then check in MATLAB. For this problem, use:

$$I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \qquad A = \begin{bmatrix} 4 & 7 \\ 2 & 6 \end{bmatrix} \qquad B = \begin{bmatrix} 0.6 & -0.7 \\ -0.2 & 0.4 \end{bmatrix}$$

   (a) Find AI

   (b) Find IA

   (c) Find IB

   (d) Find AB

   (e) What is B? There is a MATLAB command `inv`. What is `>> inv(A)` ?

7. For the following system of linear equations,

$$7 = 2I_1 + 5I_2 - 3I_3$$

$$11 = 7I_2 + 2I_2 + 4I_3$$

$$25 = 9I_1 - 3I_2 - 8I_3$$

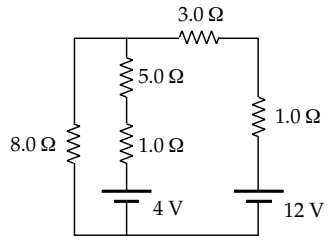
   You could write them as matrix multiplication as so:

$$\begin{bmatrix} 7 \\ 11 \\ 25 \end{bmatrix} = \begin{bmatrix} 2 & 5 & -3 \\ 7 & 2 & 4 \\ 9 & -3 & -8 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix}$$

   Can you figure out how to use MATLAB to solve for I_1, I_2, and I_3? Do it.

Now for a quick review of Kirchhoff's Laws.

- Kirchhoff's Voltage Rule: The sum of voltages around a closed loop is zero. (Sign of the change in voltage is important.) Sometimes you see this written as: Sum of the voltage rises = sum of voltage drops.
- Kirchhoff's Current Rule: The sum of the currents going into a branching point = sum of currents going out of that point.



8. For the circuit shown above:

   (a) Use Kirchhoff's Laws to find a system of equations for this circuit. Do this part at the white board so I can help.

   (b) Go back to MATLAB and find the three currents. Show them to me!