

In-class assignment #4

PHY-905-005
Computational Astrophysics and Astrostatistics
Spring 2023

Instructions: Consider the circuit diagram shown below. Assuming $V_0 = 100$ V, $R_0 = 100 \Omega$, $R_1 = R_2 = 50 \Omega$, and $R_3 = 75 \Omega$, use Kirchoff's current and voltage laws to create a set of linear equations that you can solve numerically to determine the currents going through each resistor. Modify the Gaussian Elimination code you wrote for your pre-class assignment to solve a system of linear equations using backward substitution, and verify analytically that you have obtained the correct answer. Also verify it using the appropriate SciPy linear algebra routine, which should be very easy to do. Upload your code when you're done!

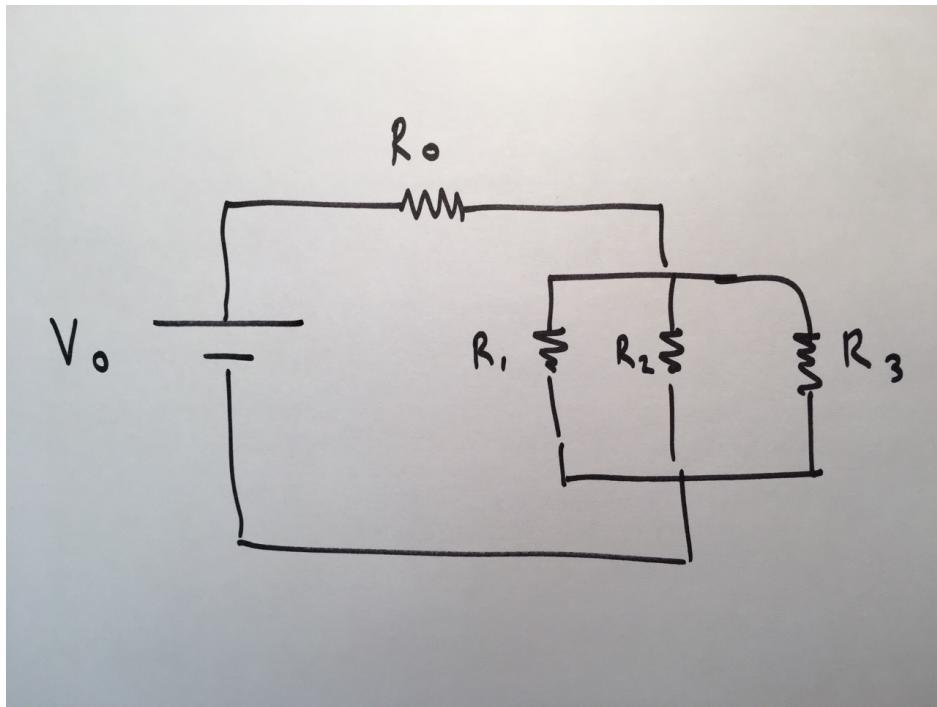


Figure 1: Simple circuit diagram. Totally not an image of something I wrote on a piece of paper and then took a picture of with my phone.

If you finish the problem listed above relatively quickly, try to implement the algorithm for LU decomposition described in Section 6.1.4 of Newman so that you can calculate currents for an arbitrary input voltage, V_0 , and verify analytically that this works. Upload this code as well, in a separate file!