Homework 9 - Physics 240
Gauss and Kirchhoff

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1 Introduction

The purpose of this excerise to practice Gaussian elimination method to solve a system of linear of equation, in this case, the system of equations is constructed by applying Kirchohff's laws of current to the circut given in the homework. The system equation I come up with is :

$$E_1 - I_1R_1 - I_2R_3 - E_2 - I_1R_2 = 0$$
$$-I_3R_4 - E_3 - I_3R_5 + E_2 + I_2R_3 = 0$$
$$I_1 - I_2 - I_3 = 0$$

Applying the values for $R_1 = R_2 = 1$, $R_3 = R_4 = 2$, $R_5 = 5$, $E_1 = 2$, $E_3 = 5$, and $E_2 = 20$ I get the following equations

$$I_1 + I_2 + 0 = -9$$
$$7I_3 - 2I_2 = 15$$
$$I_1 - I_2 - I_3 = 0$$

Putting the matrix form of this system of equation into my program and I get

$$I_1 = -4.125$$
$$I_2 = -4.875$$
$$I_3 = 0.75$$

The answers are verified with numpy.linalg, direct substitution, and reduced row echelon form methods, all of which gave the same answers.