# ROB 101 - Computational Linear Algebra
# Recitation #2

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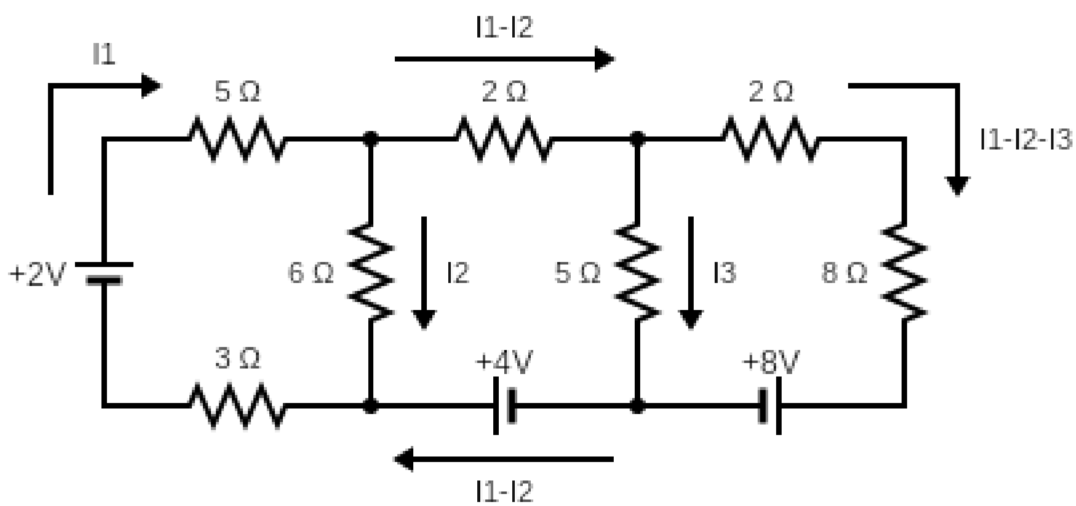
## 1 Solving $Ax = b$ using LU Decomposition

1. Convert the system of equations into $Ax = b$
2. Decompose the A matrix as $A = LU$.
3. Finally, solve using, Forward Substitution for $Ly = b$ and Backward substitution for $Ux = y$




In order to find the values of currents $I_1$ through $I_3$ in the above circuit diagram, we can use Kirchhoff's rules to represent this circuit as the following system of equations:

$$-5I_1 - 6I_2 - 3I_1 + 2 = 0$$
$$-2(I_1 - I_2) - 5I_3 + 4 + 6I_2 = 0$$
$$-10(I_1 - I_2 - I_3) - 8 + 5I_3 = 0$$

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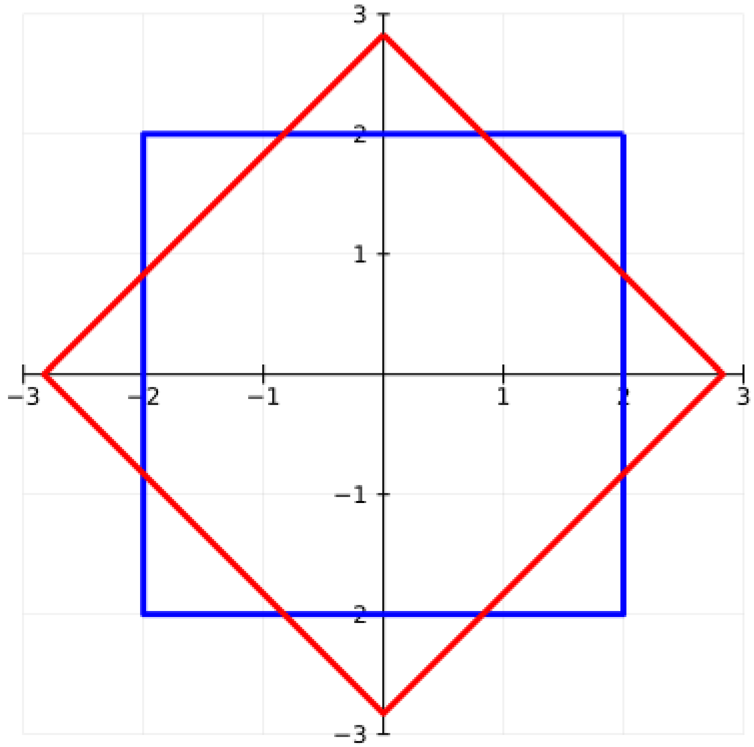
\end{aligned}
$$

## 2 LU Decomposition with Permutations

1. Convert the system of equations into $PAx = Pb$
2. Decompose the A matrix as $PA = LU$.
3. Finally, solve using, Forward Substitution for $Ly = Pb$ and Backward substitution for $Ux = y$




In linear algebra, a rotation matrix is a transformation matrix that is used to perform a rotation in Euclidean space. We will construct the transformation matrix required to rotate the blue square 45 degrees counter-clockwise so that the result is the red square.