SC223 - Linear Algebra
Autumn 2022
Tutorial 3: Solving System of Linear Equations and *LU* decomposition

1. Try to solve the following system of equations using Gaussian elimination.

   (a)

   $$\begin{aligned} x_1 - 3x_2 + 2x_3 &= 2 \\ x_1 + 4x_2 - 3x_3 &= 0 \\ x_1 + 5x_2 - 4x_3 &= 0 \end{aligned}$$

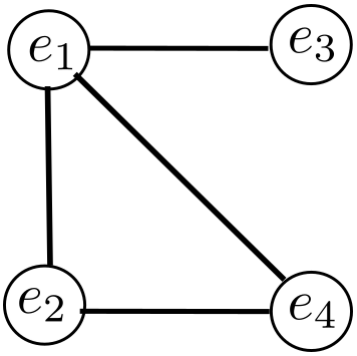
   (b)

   $$\begin{aligned} 2x_1 + 3x_2 + 2x_3 - 4x_4 &= 10 \\ 5x_1 + 3x_3 - 3x_4 &= 0 \\ x_1 + 5x_2 - 4x_3 + x_4 &= 0 \end{aligned}$$

   (c)

   $$\begin{aligned} x_1 + 5x_2 &= 2 \\ 3x_1 - 4x_2 &= 5 \\ -2x_1 + x_2 &= -3 \end{aligned}$$

2. Let e_1, e_2, e_3, e_4 denote four elective courses that were offered to your seniors. Students were asked to pre-register for their electives before the beginning of the semester. During the add-drop period (first week of the semester), once the students became aware of the evaluation policy and due to the influence of their seniors, there were a lot of changes in the registration. While half of the students remained in the courses as per the pre-registration, the remaining half were equally distributed in the courses connected by edges as shown in the figure below. After the add-drop period, the number of students in the courses is $425, 150, 250, 175$. Can you find the number of students after pre-registration (i.e., before the add-drop period)?



3. A general quadratic polynomial is given by the equation: $y = a_0 + a_1 x + a_2 x^2$. Find a specific quadratic polynomial using Gaussian elimination that passes through the points $(-1, 3), (1, 2), (3, 6)$, if possible.