

Question 1

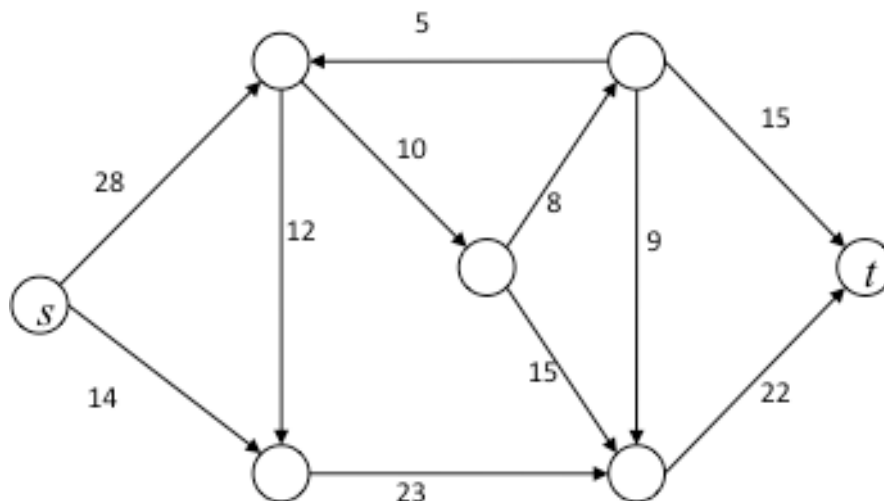
Given a directed graph $G=(N,A)$ and two nodes s and t , propose an algorithm to find the maximum number of node disjoint s - t paths.

Question 2

A group of p families goes out to dinner together. The restaurant has q tables and each table has seating capacity b_1, \dots, b_q . Describe a model to find a seating arrangement (if any) such that no two members of the same family seat at the same table.

Exercise 1

Find the maximum (s,t) -flow and the minimum (s,t) -cut on the following graph:



Exercise 2

Given the following matrix:

$$\begin{vmatrix} 6.21 & 4.33 & 7.12 & 5.21 \\ 7.28 & 9.13 & 1.45 & 11.23 \\ 4.32 & 7.23 & 6.47 & 5.67 \end{vmatrix}$$

Let

$$r_i = \sum_{j=1}^4 a_{ij}, \text{ for } i \in 1, \dots, 3$$

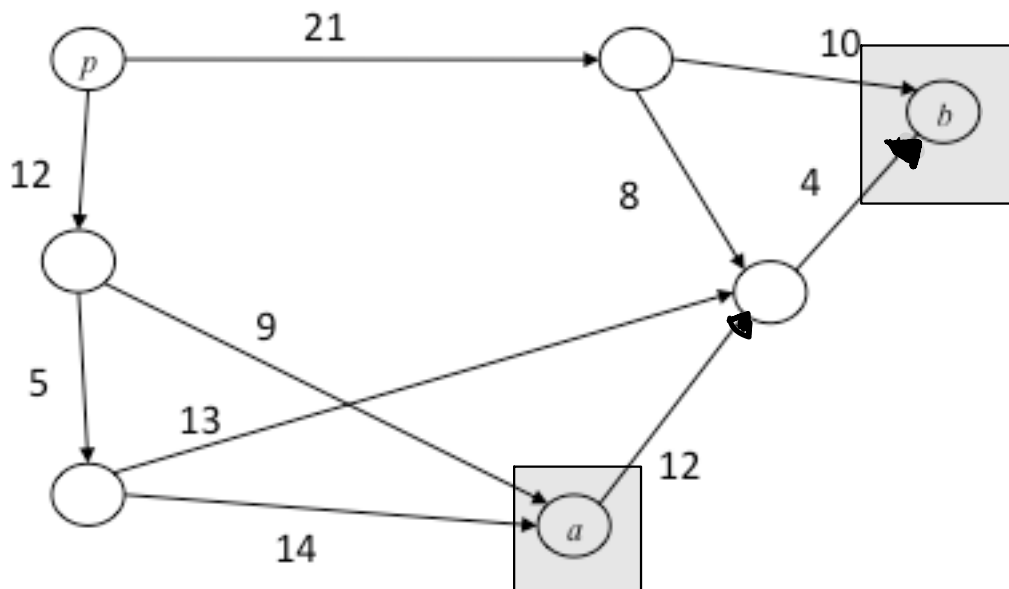
$$c_j = \sum_{i=1}^3 a_{ij}, \text{ for } j \in 1, \dots, 4$$

Round each element a_{ij} , r_i and c_j **up or down** to integer so that the sum of the rounded elements in each row (column) equals row (column) sum.

Exercise 3

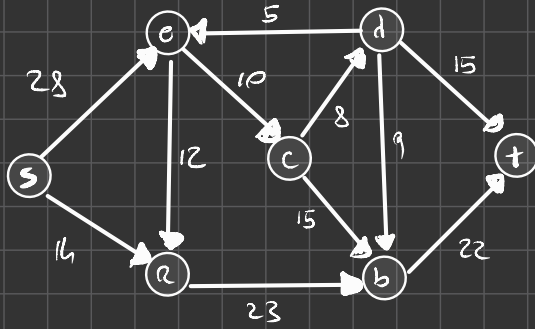
The following graph $G=(N,A)$ represents a logistic distribution network. Node p is a manufacturing plant, origin of the goods and nodes a and b represent warehouses.

1. Evaluate the maximum quantity of goods that can be shipped from the plant to the warehouses
2. Suggest a method to increase goods shipping at warehouse b by at least 10% while keeping unchanged the quantity of goods shipped at the warehouse a .

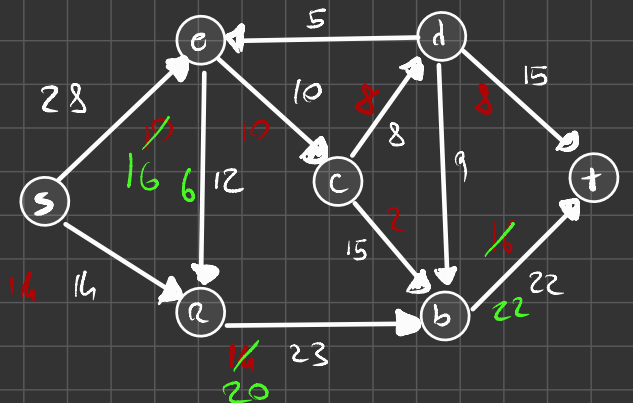
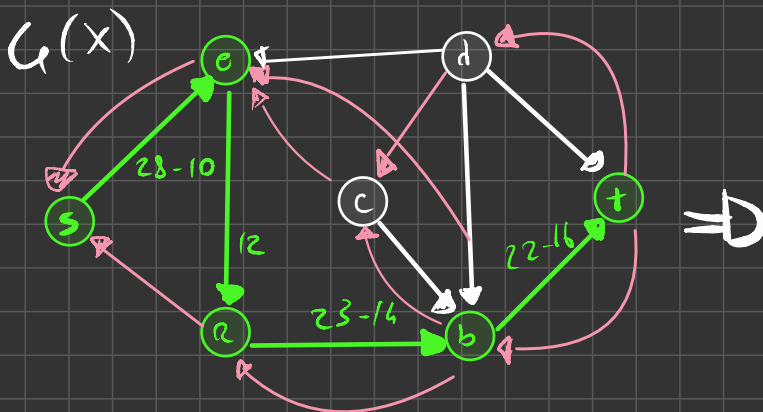
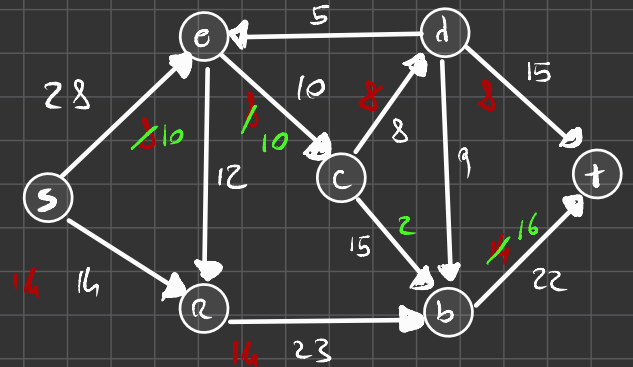
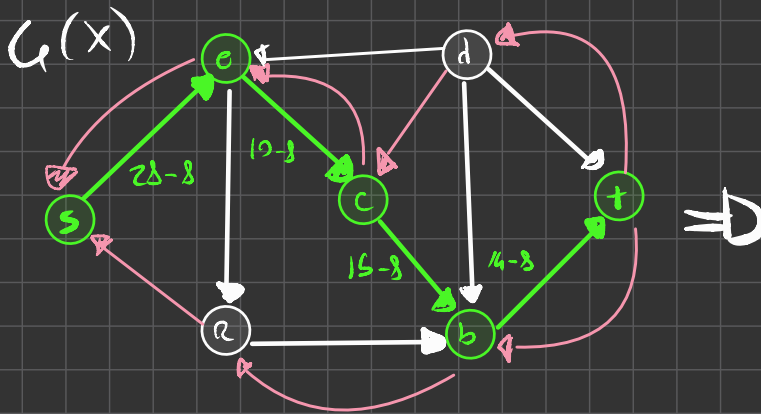
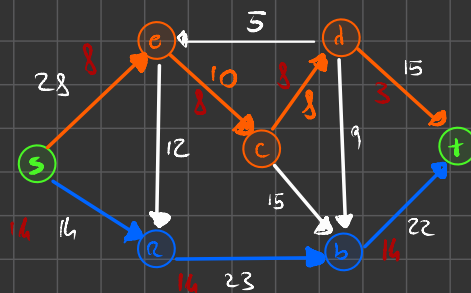


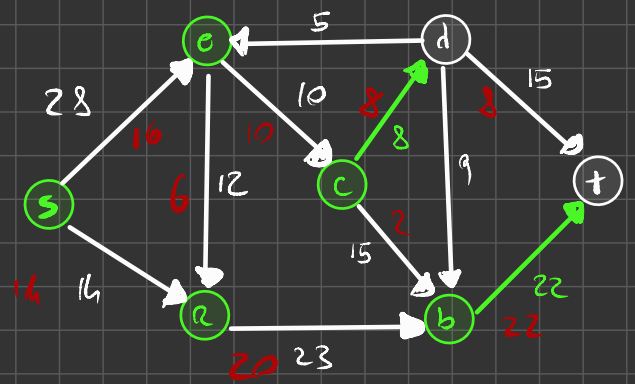
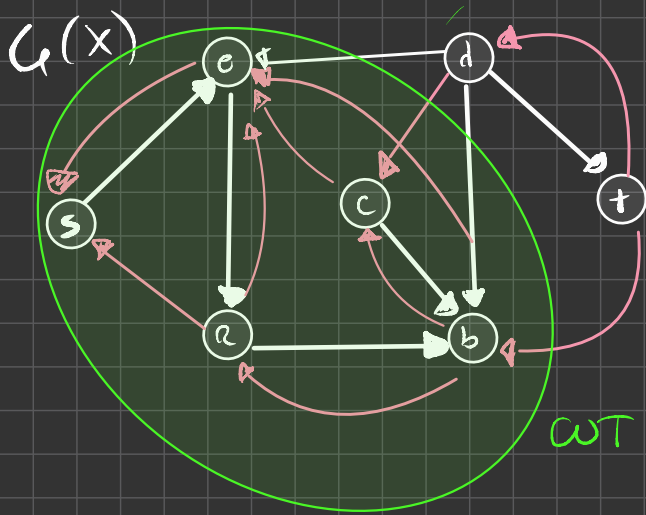
Exercise 1

Find the maximum (s,t) -flow and the minimum (s,t) -cut on the following graph:



• INIT. FLOW





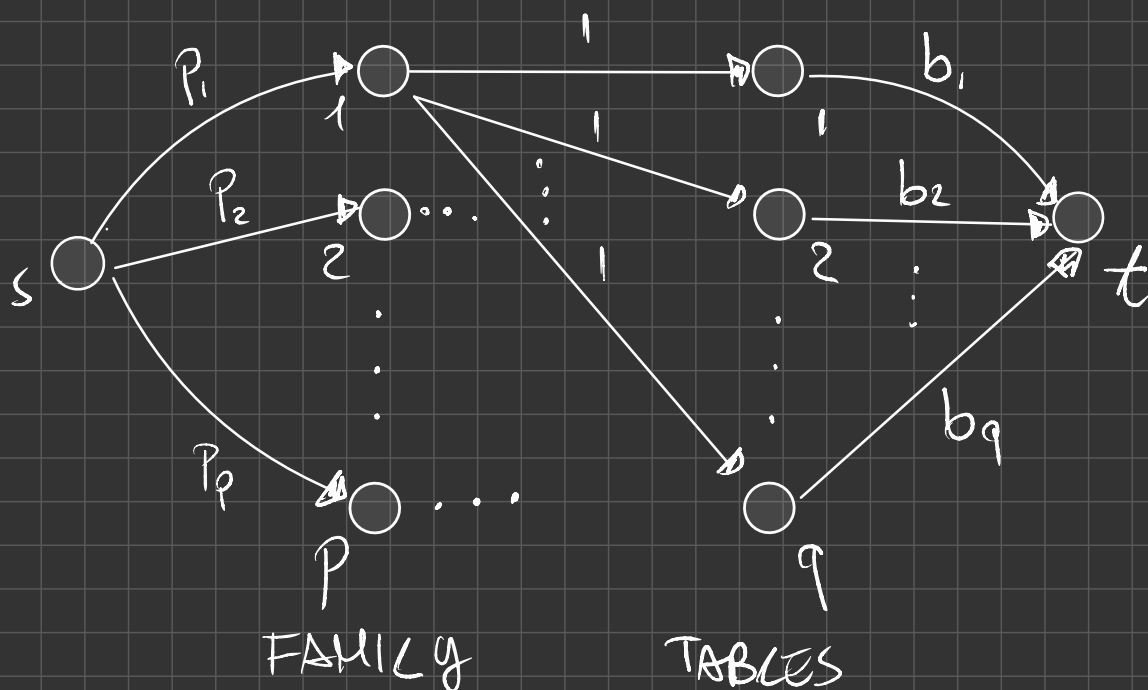
$$f_x(s) = 14 + 16 = u(f(r)) = 22 + 8 = 30$$

#Q2



Question 2

A group of p families goes out to dinner together. The restaurant has q tables and each table has seating capacity b_1, \dots, b_j . Describe a model to find a seating arrangement (if any) such that no two members of the same family seat at the same table.



$\{P_1, \dots, P_p\} \rightarrow P_i = \text{componenti FAMIGLIA } i$
 $\{b_1, \dots, b_q\} \rightarrow b_i = \text{posti TAVOLO } i$