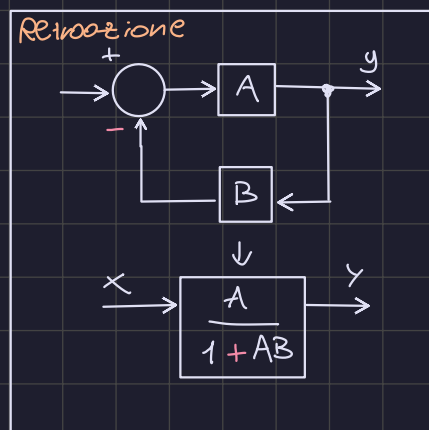
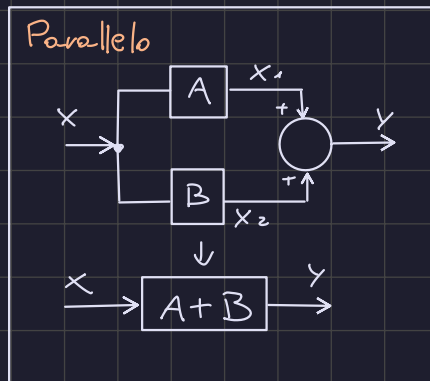
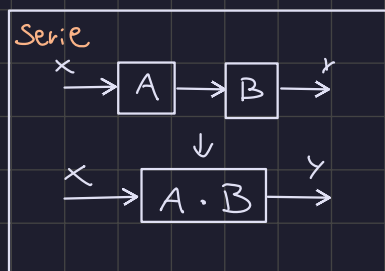
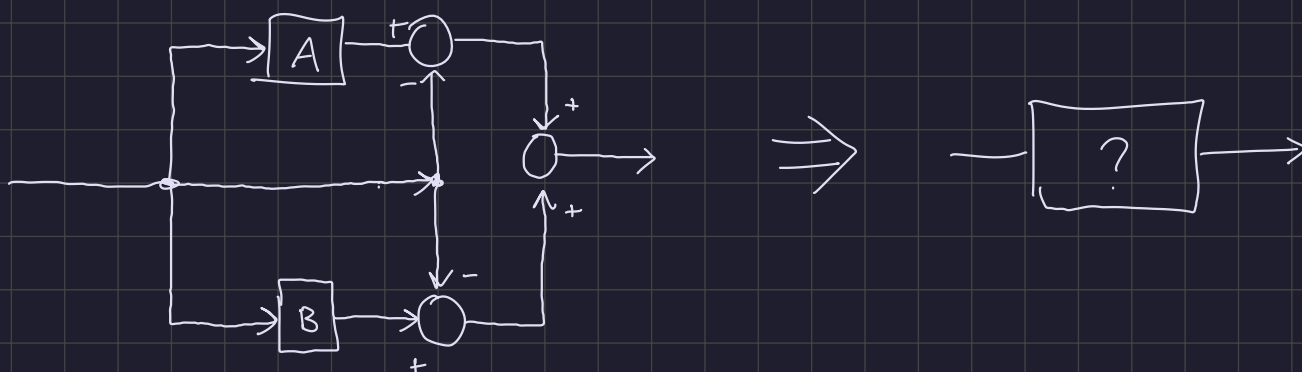


Esercitazione sui sistemi a blocchi

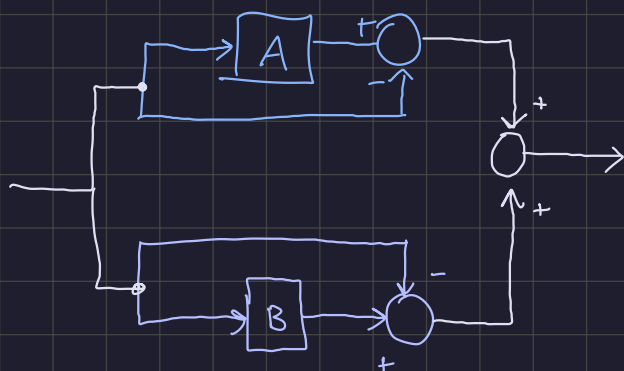
Tipi di sistemi



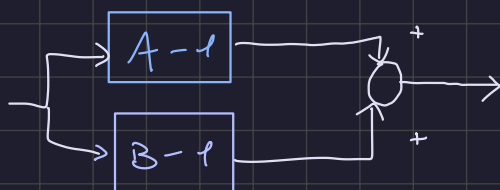
Esercizio 1



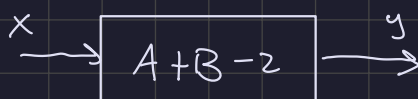
Si nota il seguente schema



\Downarrow

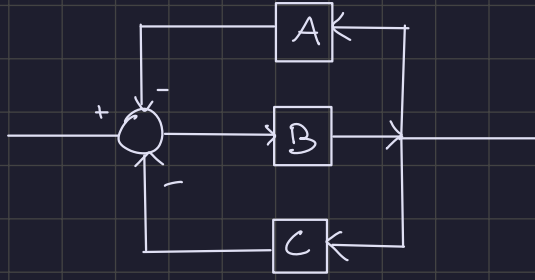


\Downarrow

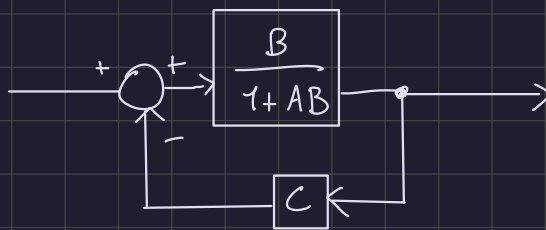


$$y = (A+B-2)x$$

Esercizio 2

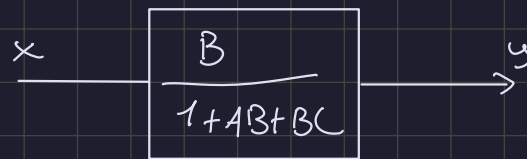


\Downarrow



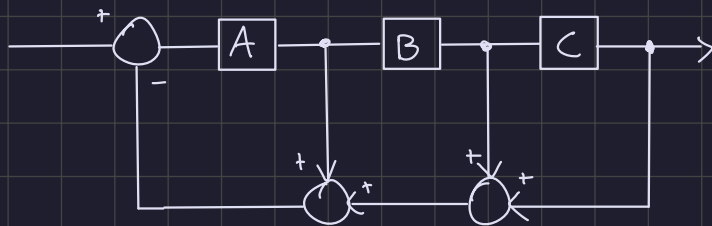
\Downarrow

$$\frac{\frac{B}{1+AB}}{1 + \left(\frac{B}{1+AB} \cdot C \right)} = \frac{\frac{B}{1+AB}}{\frac{1+AB+BC}{1+AB}} = \frac{B}{1+AB} \cdot \frac{1+AB}{1+AB+BC} = \frac{B}{1+AB+BC}$$

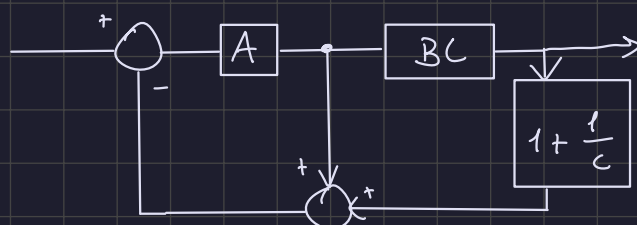
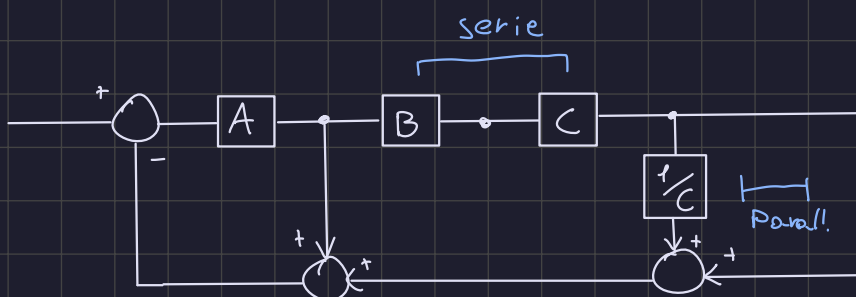
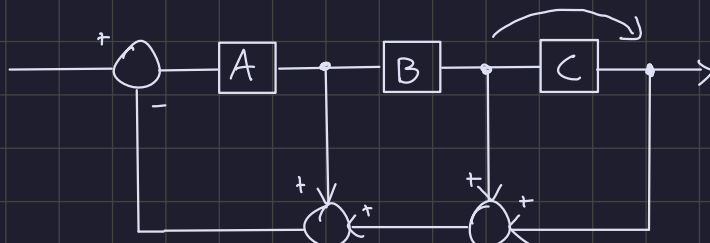
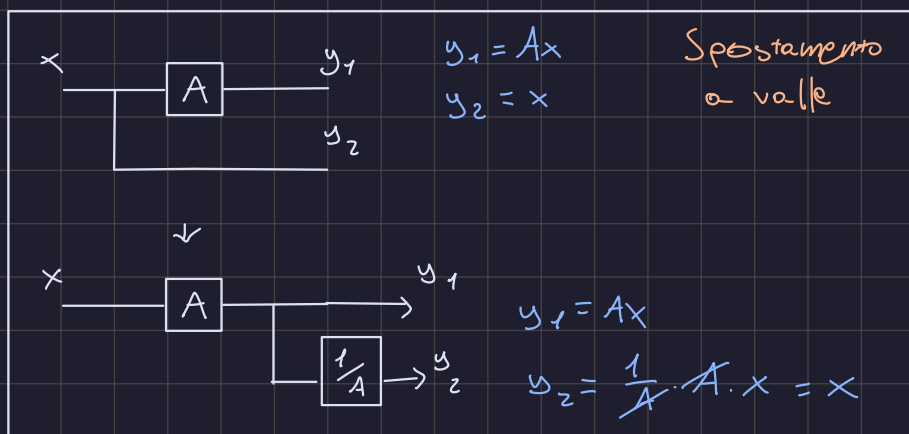


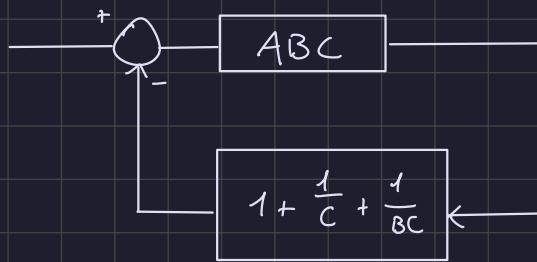
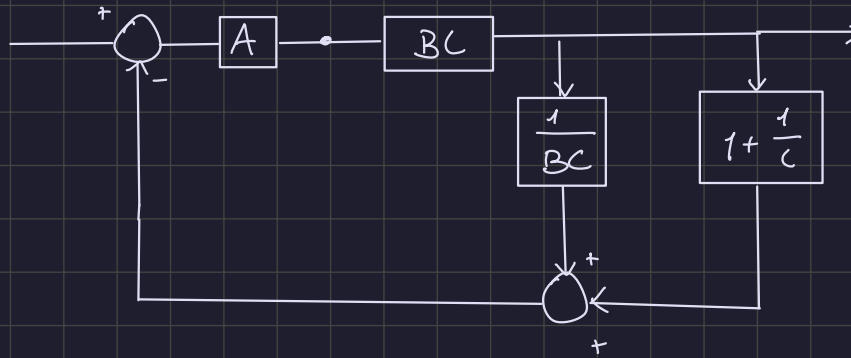
$$y = \frac{B}{1+AB+BC} x$$

Esercizio 3

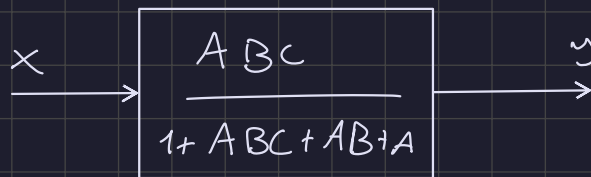


Cerchiamo di ottenere un unico anello di retroazione





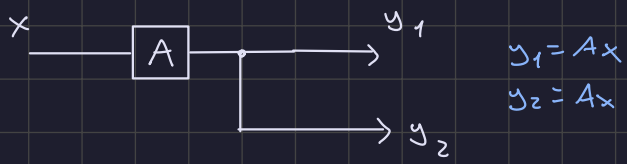
$$\frac{ABC}{1 + \left(1 + \frac{1}{c} + \frac{1}{BC}\right) ABC} = \frac{ABC}{1 + \left(\frac{BC + B + 1}{BC}\right) ABC} = \frac{ABC}{1 + ABC + AB + A}$$



$$y = \frac{ABC}{1 + ABC + AB + A} \cdot x$$

Esercizio 4

Biforcazione a monte



$$y_1 = Ax$$

$$y_2 = Ax$$

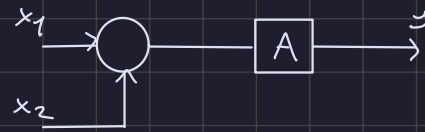
⇓



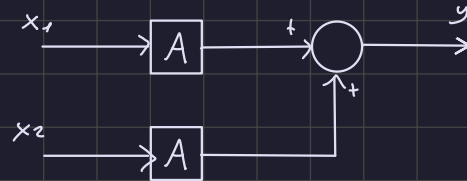
$$y_1 = Ax$$

$$y_2 = Ax$$

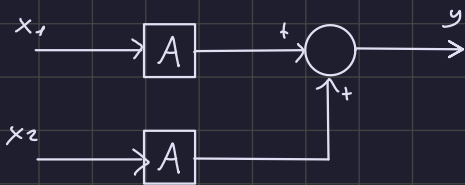
Sommatore a valle



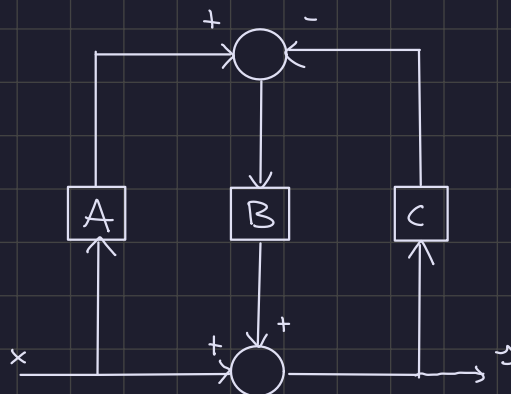
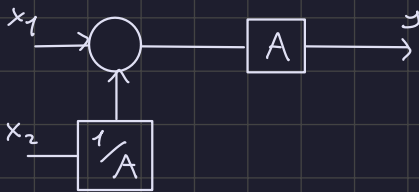
⇓



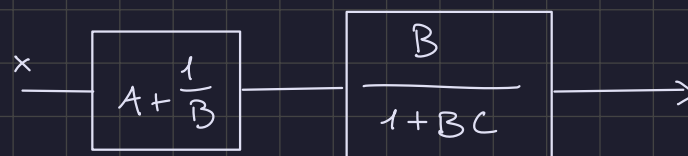
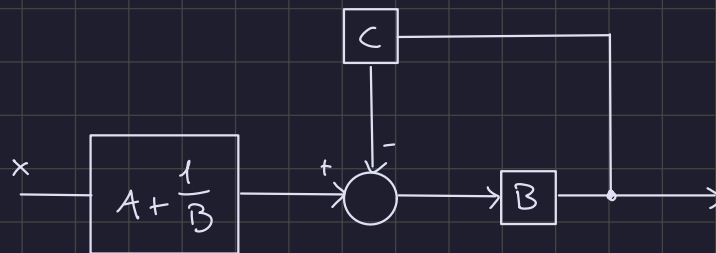
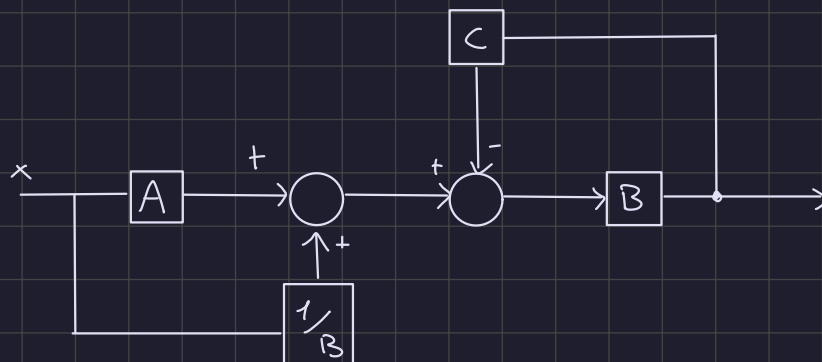
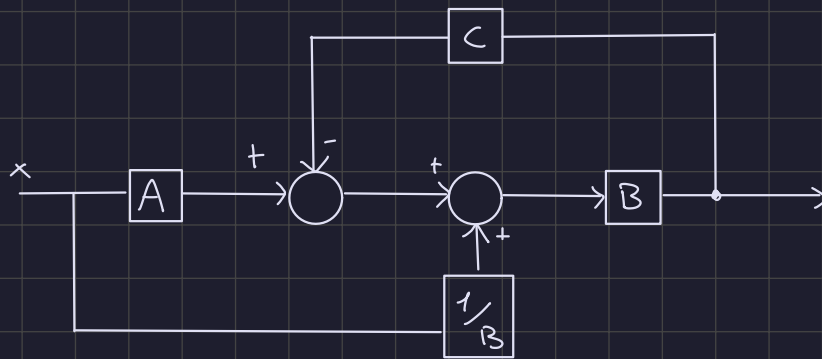
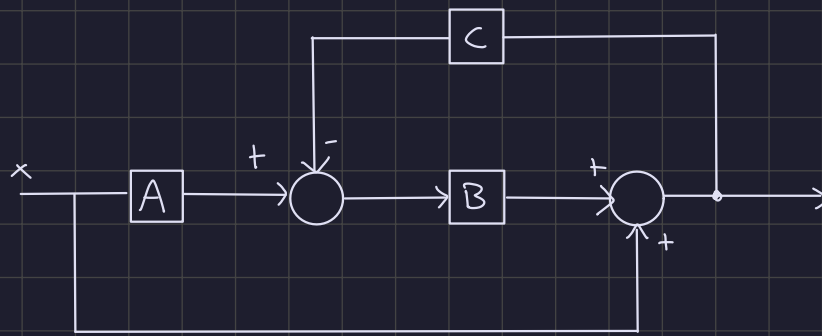
Sommatore a monte



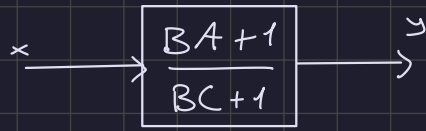
⇓



⇓



$$\left(A + \frac{1}{B}\right) \left(\frac{B}{1+BC}\right) = \frac{BA+1}{\cancel{B}} \cdot \frac{\cancel{B}}{1+BC} = \frac{BA+1}{BC+1}$$

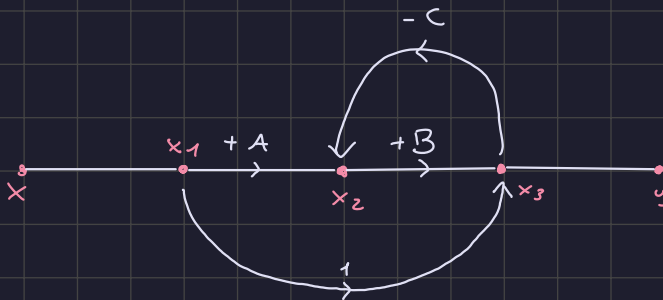
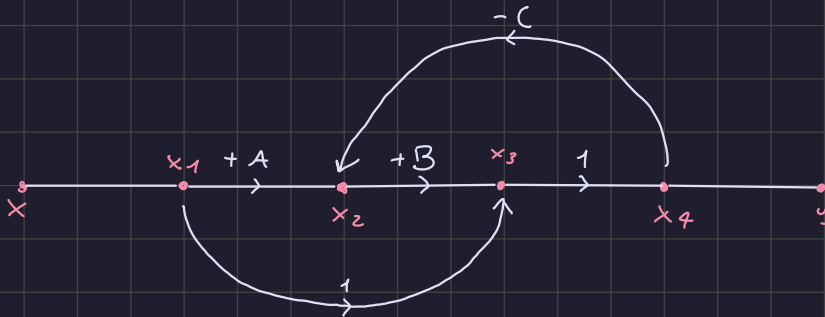
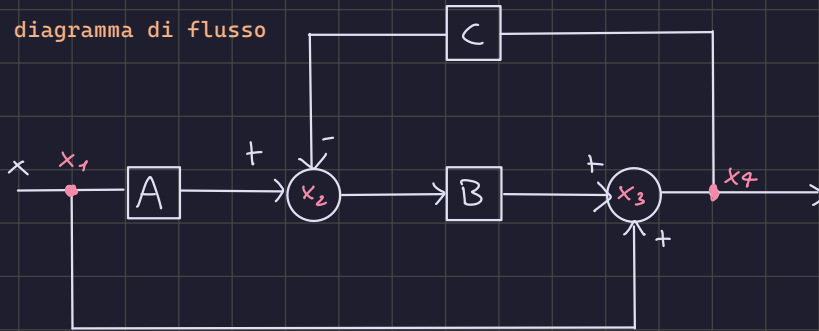


$$y = \frac{BA+1}{BC+1} x$$

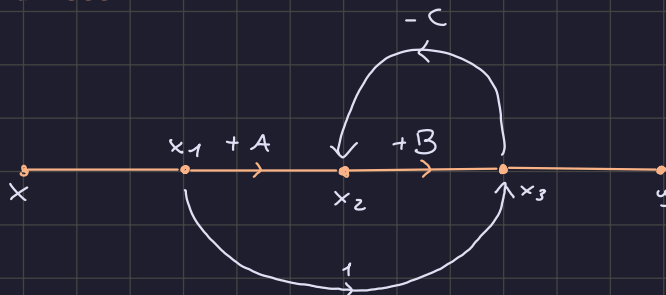
APPROCCIO ALGORITMICO (schemi di flusso)

Esercizio 5

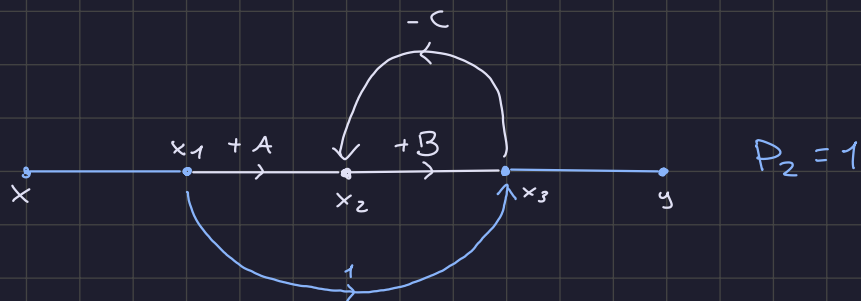
1) Disegnare il diagramma di flusso



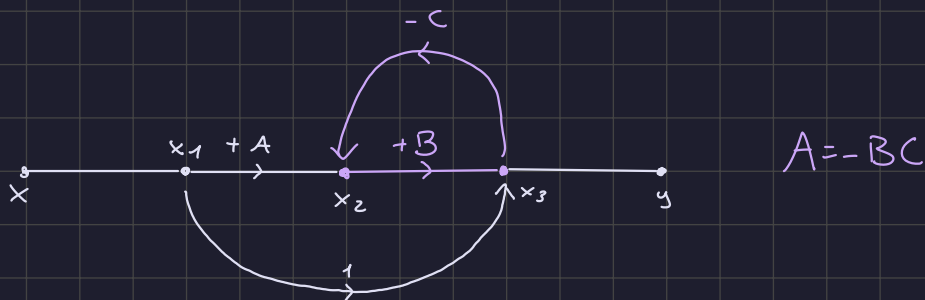
2) Trovare i percorsi diretti



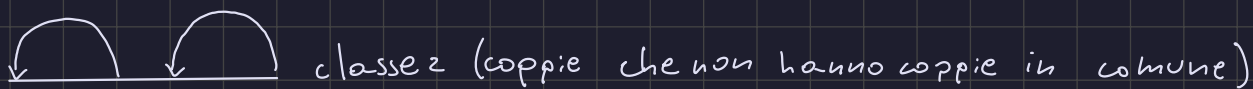
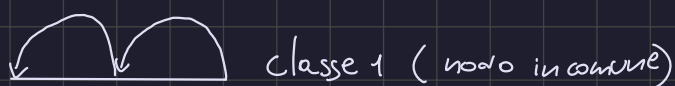
$$P_1 = AB$$



3) Trovare gli archi



4) Individuare la classe degli archi



$$A_1^1 = -BC$$

5) Calcolare il determinante totale

$$\Delta = 1 + \sum_{k=1}^n \underbrace{\sum_{j=1}^{h_k} (-1)^k A_j^k}_{\text{somma di archi di classe } k}$$

h_k = numero di archi nella classe

$$\Delta = 1 + (-1)^1 (-BC) = 1 + BC$$

5) Calcolare il determinante per i percorsi diretti

Si escludono gli archi che hanno nodi in comune coi percorsi

Il percorso 1 passa per x_2 e x_3 che fa parte dell'anello A_1 , quindi si esclude ... e così via

$$\Delta_1 = 1 - 0 = 1$$

Il percorso 1 ha in comune x_2 e x_3 con l'unico arco A, quindi si esclude

$$\Delta_2 = 1 - 0 = 1$$

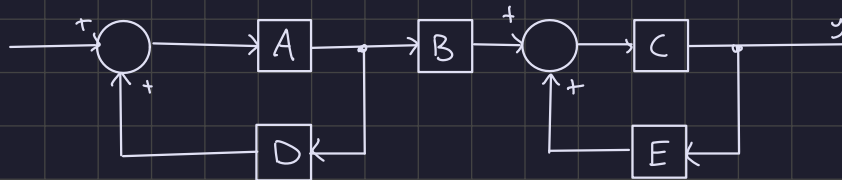
Il percorso 2 ha in comune x_3 con l'arco A, quindi si esclude

6) Formula di Mason

$$G = \frac{\sum_i^m P_i \Delta_i}{\Delta}$$

$$G = \frac{AB \cdot 1 + 1 \cdot 1}{1 + BC} = \frac{1 + AB}{1 + BC}$$

Esercizio 6



$$P_1 = ABC$$

$$A_1' = -AD$$

$$A_2' = -ADCE$$

$$A_2' = CE$$

classe 1

classe 2

$$\Delta = 1 + (-1)^1 (-AD + CE) \quad \kappa=1$$

$$+ (-1)^2 (-ADCE) \quad \kappa=2$$

$$= 1 + AD - CE - ADCE$$

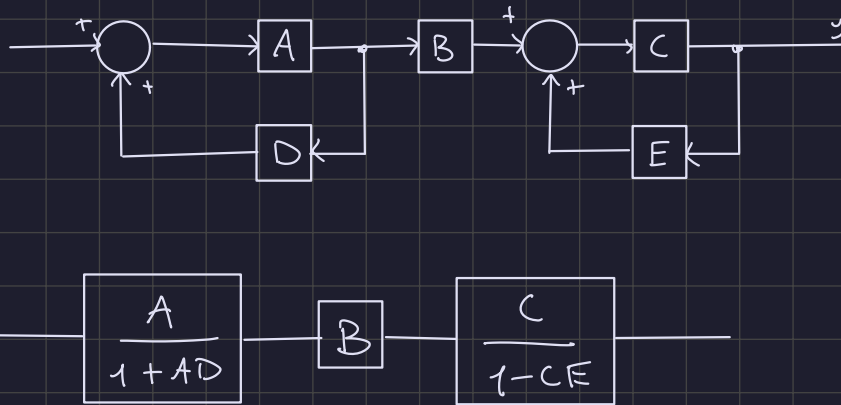
$$\Delta_1 = 1 + (-1)^1 (\cancel{-AD}^0 + \cancel{CE}^0)$$

$$+ (\cancel{-ACD}^0 \cancel{E}^0)$$

$$= 1$$

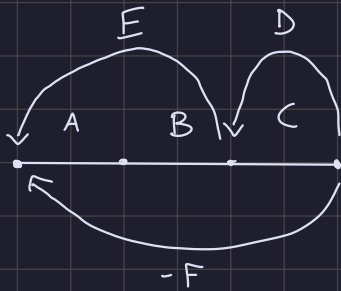
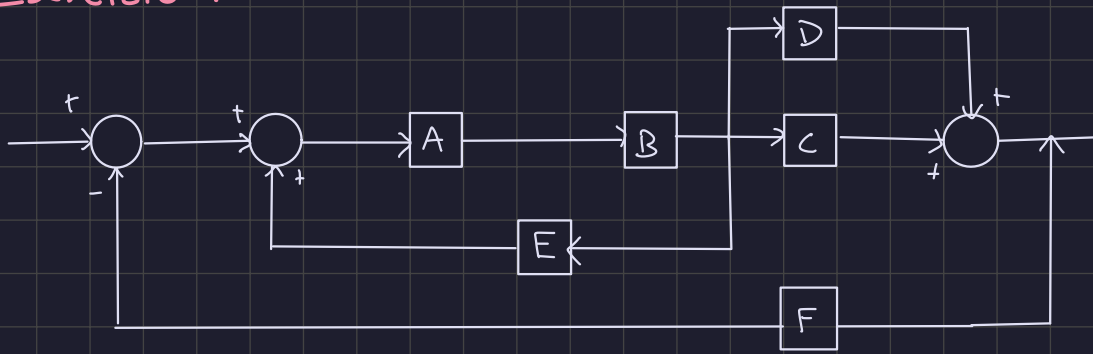
$$G = \frac{P_1 \cdot \Delta_1}{\Delta} = \frac{ABC \cdot 1}{1 + AD - CE - ADCE}$$

Controlliamo risolvendo il sistema a blocchi



$$\frac{A}{1+AD} \cdot B \cdot \frac{C}{1-CE} = \frac{ABC}{(1+AD)(1-CE)} = \frac{ABC}{1+AD-CE-ADCE}$$

Esercizio 7



$$P_1 = ABC$$

$$P_2 = ABD$$

$$A_1^1 = -ABCF$$

$$A_2^1 = -ABDF$$

$$A_3^1 = ABE$$

$$\Delta = 1 + (-1)^1 (-ABCF - ABDF + ABE)$$

$$= 1 + ABCF + ABDF - ABE$$

$$\Delta_1 = 1$$

$$\Delta_2 = 1$$

$$G = \frac{ABC + ABD}{1 + ABCF + ABDF - ABE} = \frac{AB(C + D)}{1 + AB(CF + DF - E)}$$