# Graph

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# ANARC08G - Think I will Buy Me a Football Team

## Graph Definition

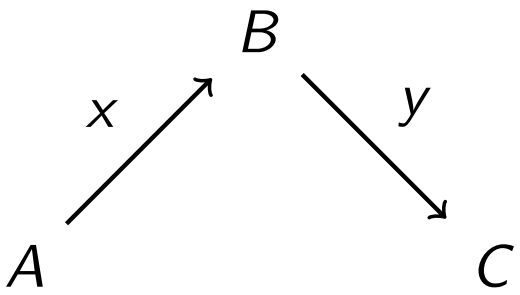
- Each bank is represented as a node.
- Each debt is represented as an arc beetween two nodes labeled with the debt amount.

## Questions

- How can you compute the total amount of money needed to settle all debts between the banks?
- How can you reduce this total amount?

# ANARC08G - Transitivity Reduction Rule

## Transitivity Reduction Rule




## Question

The current flow is $x + y$.

**How can you reduce the flow?**

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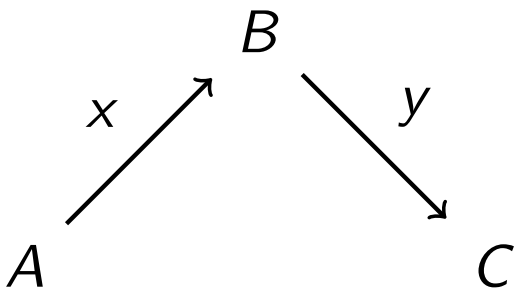



## Question

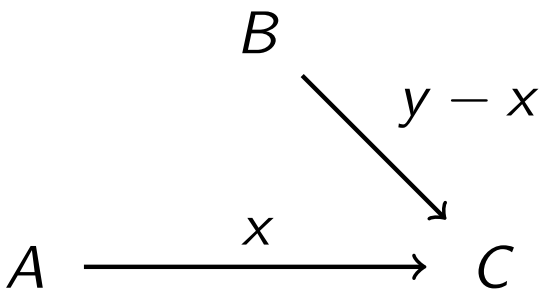
The current flow is $x + y$.

**How can you reduce the flow?**

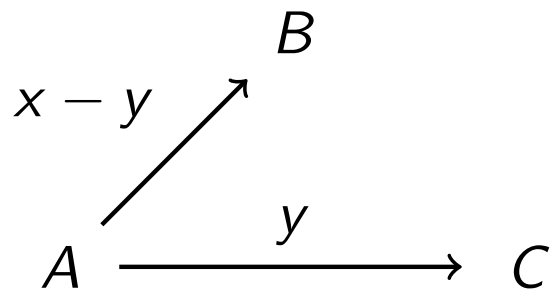
## Answer

The flow is reduced to $\max(x, y)$.

## $y \geq x$




## $y \leq x$



# ANARC08G - Fixpoint algorithm

## Fixpoint Algorithm

Apply repeatedly the transitivity reduction rule on the graph until it is not possible.

## Questions

- What is the complexity of the fixpoint algorithm?
- Which properties are satisfied by the graph when the fixpoint has been reached?
- Is the resulting graph unique?
- Can you propose better algorithm that solves the problem? What is its complexity?