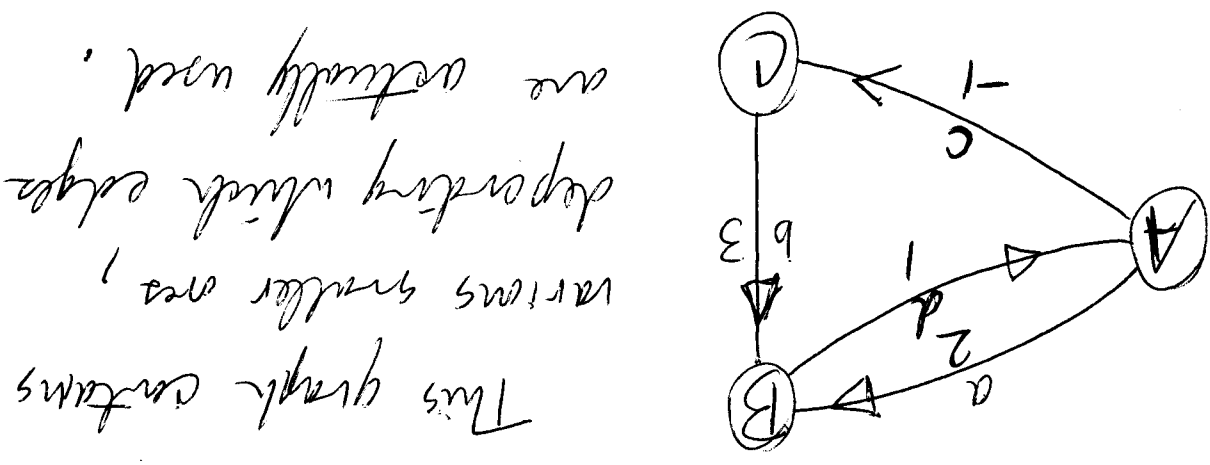


MATH 410 (PARTY) Network problems: ①



This graph contains various smaller areas, depending which edges are actually used.

① IF you only use edges  $a$  &  $b$ , solve  $Ax = b$  & identify the free variable & null vector.

② What are the team rankings?

③ IF you have 1 unit of B currency,

what is its equivalent in A, C currencies?

④ Add edge  $e$  & repeat question ①

⑤ Add edge  $d$ . Can you still make the teams? Can you make money by currency arbitrage? How?

For all the <sup>foregoing</sup> ~~following~~ questions

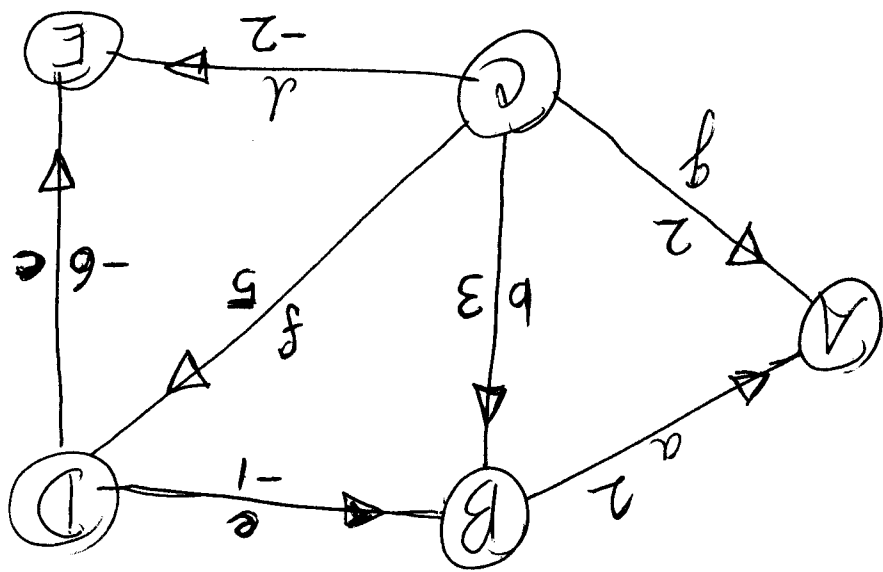
(2)

$$\vec{x} = \begin{pmatrix} x_A \\ x_B \\ x_C \end{pmatrix}, \quad \vec{b} = \begin{pmatrix} b_a \\ b_b \\ b_c \\ b_d \end{pmatrix} \leftarrow \text{or however many entries we actually use.}$$

And  $A$  will be the edge-node matrix of the network. We will assume that we don't use all the edges; each problem will say which edges to use.

In the context of sports teams, the labels are score differences = Home - Visitor (arrow points FROM VISITOR TO HOME team).

In context of currency, label =  $\log_2$  (exchange rate in direction of arrow).



INVESTIGATE the same question for the

graphs you get, starting with edges  $a, b, e$

and adding in  $d, e, f, g$  successively.

The matrix calculations may get pretty big, so

you should use a calculator/computer.

BUT before you do so, look at each graph

and identify pieces & cycles to get an idea of

what ~~some~~ issues will arise when analyzing

$$Ax = b.$$