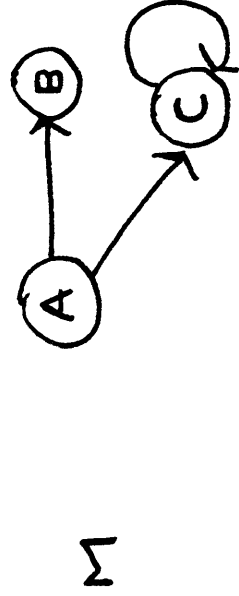


2a

FIGURE 1



PageRank not conserved. (vertex B)

Vertex C dangling (concentrates pagerank)

Find pagerank $A=0, B=0, C=\frac{1}{2}$

$$H = \begin{bmatrix} 0 & \frac{1}{2} & \frac{1}{2} \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad H' = \begin{bmatrix} 0 & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{3} & \frac{1}{3} & \frac{1}{3} \\ 0 & 0 & 1 \end{bmatrix}$$

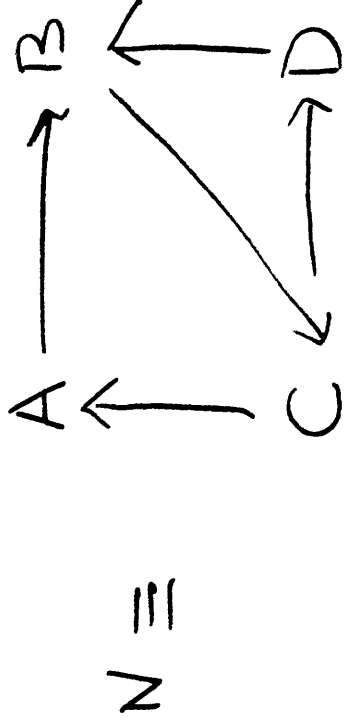
2c

Google Matrix of N

$$G = \frac{1}{2} \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ \frac{1}{2} & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & 0 \end{bmatrix} + \frac{1}{2} \begin{bmatrix} \frac{1}{4} & \frac{1}{4} & \frac{1}{4} & \frac{1}{4} \\ \frac{1}{4} & \frac{1}{4} & \frac{1}{4} & \frac{1}{4} \\ \frac{1}{4} & \frac{1}{4} & \frac{1}{4} & \frac{1}{4} \\ \frac{1}{4} & \frac{1}{4} & \frac{1}{4} & \frac{1}{4} \end{bmatrix}$$

FIGURE 1b.

Figure 2



$$H = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ \frac{1}{2} & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

1st two iterations A B C D

$$R_0 = \begin{bmatrix} \frac{1}{4} & \frac{1}{4} & \frac{1}{4} & \frac{1}{4} \end{bmatrix}$$

$$R_1 = \begin{bmatrix} \frac{1}{8} & \frac{1}{2} & \frac{1}{4} & \frac{1}{8} \end{bmatrix}$$

$$R_2 = \begin{bmatrix} \frac{1}{8} & \frac{1}{4} & \frac{1}{2} & \frac{1}{8} \end{bmatrix}$$

$$\pi = \pi_{\infty} = \begin{bmatrix} \frac{1}{6} & \frac{1}{3} & \frac{1}{3} & \frac{1}{6} \end{bmatrix}$$

$$\pi = \pi H \quad \text{solution}$$

The network N is strongly connected so
a $\pi = \pi H$ solution is provide starting from $\begin{pmatrix} \frac{1}{4} & \frac{1}{4} & \frac{1}{4} & \frac{1}{4} \end{pmatrix}$