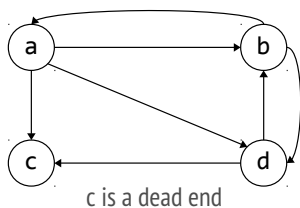


Dead ends

- **Dead ends:** nodes that have no out-links.



Transition matrix:

$$\begin{bmatrix} 0 & 1/2 & 0 & 0 \\ 1/3 & 0 & 0 & 1/2 \\ 1/3 & 0 & 0 & 1/2 \\ 1/3 & 1/2 & 0 & 0 \end{bmatrix}$$

- The **transition matrix** does not have full rank.
- It cannot be **inverted**, i.e. our linear system of equations has **no solution**.
- The **power method** converges to $\vec{v} = \vec{0}$.
- **Solutions:**
 - Recursively **remove** dead ends and their incoming links.
 - When at a dead end, **teleport** (with equal probability) to another node.