# Homework assigned Monday, February 13.

First here is some practice multiplication of matrices times vectors.

- If $L = \begin{bmatrix} 3 & 1 \\ 4 & 2 \end{bmatrix}$ and $\vec{n} = \begin{bmatrix} 5 \\ 7 \end{bmatrix}$, then $L\vec{n} = \begin{bmatrix} 22 \\ 34 \end{bmatrix}$

- If $L = \begin{bmatrix} 4 & 2 \\ 3 & 1 \end{bmatrix}$ and $\vec{n} = \begin{bmatrix} 6 \\ 5 \end{bmatrix}$, then $L\vec{n} = \begin{bmatrix} 34 \\ 23 \end{bmatrix}$

- If $L = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$ and $\vec{n} = \begin{bmatrix} 10 \\ 11 \\ 12 \end{bmatrix}$, then $L\vec{n} = \begin{bmatrix} 68 \\ 167 \\ 266 \end{bmatrix}$

- If $L = \begin{bmatrix} 0 & 1.5 & 12 \\ .1 & 0 & 0 \\ 0 & .7 & 0 \end{bmatrix}$ and $\vec{n} = \begin{bmatrix} 200 \\ 25 \\ 10 \end{bmatrix}$, then $L\vec{n} = \begin{bmatrix} 160 \\ 20 \\ 18 \end{bmatrix}$

And here is some practice with changing diagrams into Leslie matrices and doing some computations.

- Find the Leslie diagram for the diagram
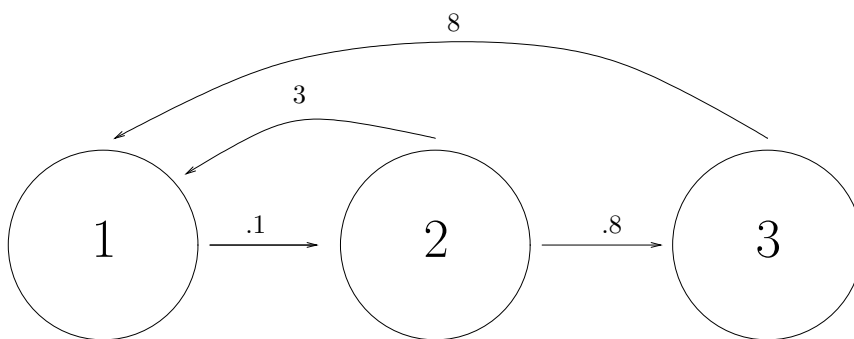
$$Answer: \qquad L = \begin{bmatrix} 0 & 3 & 0 \\ .1 & 0 & 0 \\ 0 & .8 & 8 \end{bmatrix}$$

If $\vec{n}_0 = \begin{bmatrix} 1000 \\ 120 \\ 80 \end{bmatrix}$, use matrix multiplication to find $\vec{n}_1$ and $\vec{n}_2$.
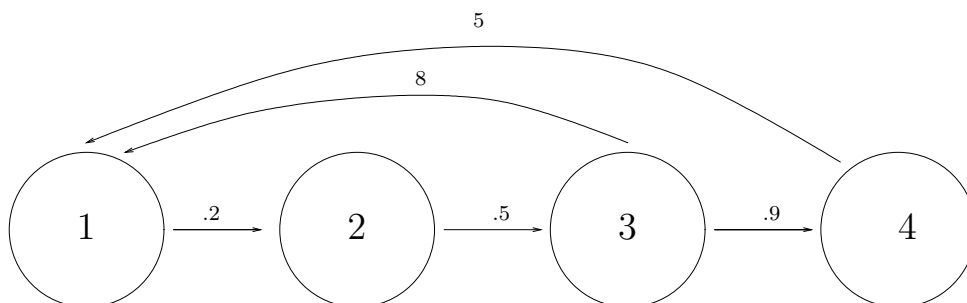
Answer:

$$\vec{n}_1 = L\vec{n}_0 = \begin{bmatrix} 360 \\ 100 \\ 160 \end{bmatrix}$$

$$\vec{n}_2 = L\vec{n}_1 = \begin{bmatrix} 300 \\ 36 \\ 210 \end{bmatrix}$$

$$\vec{n}_3 = L\vec{n}_2 = \begin{bmatrix} 110 \\ 30 \\ 190 \end{bmatrix}$$

(I know that the problem only ask for $\vec{n}_1$ and $\vec{n}_2$, but I put in $\vec{n}_3$ just in case you wanted more practice.)

- Find the Leslie diagram for the diagram

Answer: $\quad L = \begin{bmatrix} 0 & 0 & 8 & 5 \\ .2 & 0 & 0 & 0 \\ 0 & .5 & 0 & 0 \\ 0 & 0 & .9 & 0 \end{bmatrix}$

If $\vec{n}_0 = \begin{bmatrix} 1000 \\ 240 \\ 200 \\ 100 \end{bmatrix}$ find $\vec{n}_1$ and $\vec{n}_2$. *Answer:*

$$\vec{n}_1 = \begin{bmatrix} 2100 \\ 200 \\ 120 \\ 180 \end{bmatrix}$$

$$\vec{n}_2 = \begin{bmatrix} 1900 \\ 420 \\ 100 \\ 110 \end{bmatrix}$$