Mathematics 172 Homework

1. Consider the following loop diagram:

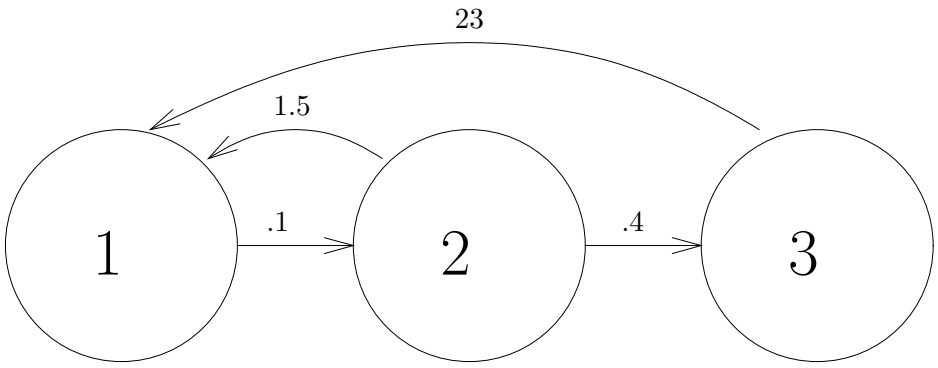

FIGURE 1

(a) What is the Leslie matrix? *Answer:* $L = \begin{bmatrix} 0 & 1.5 & 23 \\ .1 & 0 & 0 \\ 0 & .4 & 0 \end{bmatrix}$

(b) Use your calculator to compete the following diagram:

$x\backslash t$	0	1	20	30
1	72			
2	15			
3	3			

Answer:

$x\backslash t$	0	1	20	30
1	72	91.5	171.86	200.38
2	15	7.2	16.96	20.41
3	3	6.0	5.55	8.31

(c) years $t = 20$ and $t = 30$ what are the percentages in each class?

Answer: For $t = 20$ the breakdown is 88.41% in stage 1, 8.73% in stage 2, and, 2.86% in stage 3.

For $t = 20$ the breakdown is 87.74% in stage 1, 9.91% in stage 2, and, 3.63% in stage 3.

2. For the loop diagram

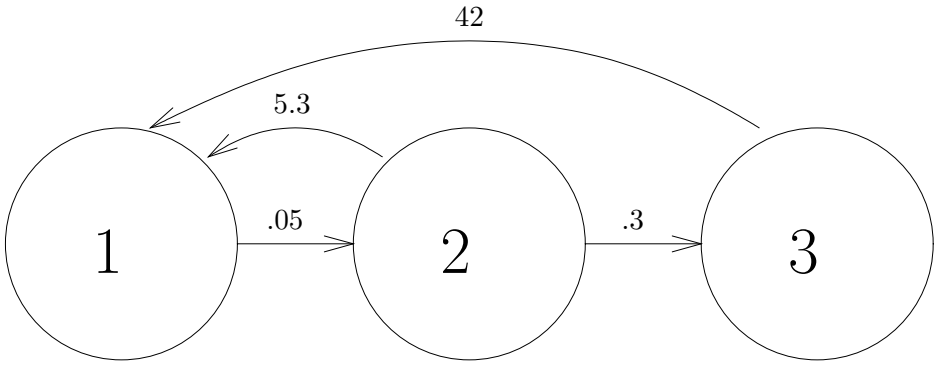

FIGURE 2

(a) Give the Leslie matrix. *Answer:* $L = \begin{bmatrix} 0 & 5.3 & 43 \\ .05 & 0 & 0 \\ 0 & .3 & 0 \end{bmatrix}$

(b) If $\vec{n}(0) = \begin{bmatrix} 800 \\ 10 \\ 5 \end{bmatrix}$ use your calculator to fine $\vec{n}(1)$, $\vec{n}(20)$ and $\vec{n}(30)$.

Answer:

$$\vec{n}(1) = \begin{bmatrix} 263 \\ 40 \\ 3 \end{bmatrix}, \quad \vec{n}(20) = \begin{bmatrix} 201.0 \\ 10.1 \\ 3.16 \end{bmatrix}, \quad \vec{n}(30) = \begin{bmatrix} 129.97 \\ 6.82 \\ 2.13 \end{bmatrix}$$

(c) For $\vec{n}(20)$ and $\vec{n}(30)$ what is the percentage in each class?

Answer: For $t = 20$ the vector of percents is $\begin{bmatrix} 93.84\% \\ 4.68\% \\ 1.46\% \end{bmatrix}$.

For $t = 30$ the vector of percents is $\begin{bmatrix} 93.55\% \\ 4.91\% \\ 1.53\% \end{bmatrix}$