```
> #OK to post homework
  #Shreya Ghosh, 09-27-2021, Assignment 6
  with(LinearAlgebra):
> read "/Users/shreyaghosh/Documents/M5.txt"
> Help5()
```

$$RecToSeq(INI,REC,N), GrowthC(INI,REC,K) , GrowthCe(REC)$$
$$LeslieMod(SUR,FER): e.g. LeslieMod([9/10,9/10],[0,1,1]);$$
$$LeslieMat(SUR,FER); e.g. LeslieMat([9/10,9/10],[0,1,1]); \qquad (1)$$

```
> #1.
  #n0(t)=0.1·n0(t-1) +1.2·0.95·n0(t-2) +0.9·0.97·0.95·n0(t-3) +0.1·0.9·0.97·0.95·n0(t-4)
  #REC = [0.1, 1.2·0.95, 0.9·0.97·0.95, 0.1·0.9·0.97·0.95]
  GrowthCe([0.1, 1.2·0.95, 0.9·0.97·0.95, 0.1·0.9·0.97·0.95])
```

$$1.385732629 \qquad (2)$$

```
> #2.
  LMat := LeslieMat([0.95, 0.97, 0.9], [0.1, 1.2, 0.9, 0.1])
```

$$LMat := \begin{bmatrix} 0.1 & 1.2 & 0.9 & 0.1 \\ 0.95 & 0 & 0 & 0 \\ 0 & 0.97 & 0 & 0 \\ 0 & 0 & 0.9 & 0 \end{bmatrix} \qquad (3)$$

```
> evalf(Eigenvalues([[0.1, 1.2, 0.9, 0.1], [0.95, 0, 0, 0], [0, 0.97, 0, 0], [0, 0, 0.9, 0]]))
```

$$\begin{bmatrix} 1.38573262885364 + 0. \, I \\ -0.583351516086361 + 0.403125877485025 \, I \\ -0.583351516086361 - 0.403125877485025 \, I \\ -0.119029596680917 + 0. \, I \end{bmatrix} \qquad (4)$$

```
> #3.
  P := Matrix([[0.5, 0.5/3, 0.5/3, 0.5/3], [0.6/3, 0.4, 0.6/3, 0.6/3], [0.7/3, 0.7/3, 0.3, 0.7/3], [0.8/3, 0.8/3, 0.8/3, 0.2]])
```

$$P := \begin{bmatrix} 0.5 & 0.1666666667 & 0.1666666667 & 0.1666666667 \\ 0.2000000000 & 0.4 & 0.2000000000 & 0.2000000000 \\ 0.2333333333 & 0.2333333333 & 0.3 & 0.2333333333 \\ 0.2666666667 & 0.2666666667 & 0.2666666667 & 0.2 \end{bmatrix} \qquad (5)$$

```
> evalm(P^1000)
```

$$(6)$$

$$\left[\begin{array}{cccc} 0.315197007189535 & 0.262664172672964 & 0.225140719443164 & 0.196998129500334 \\ 0.315197007144518 & 0.262664172635450 & 0.225140719411009 & 0.196998129472198 \\ 0.315197007112362 & 0.262664172608653 & 0.225140719388041 & 0.196998129452101 \\ 0.315197007176895 & 0.262664172662431 & 0.225140719434135 & 0.196998129492434 \end{array} \right]$$

(6)

> *#Page Rank: S1 > S2 > S3 > S4*