Vector recurrence / leslie matrix

Homework 5 on lecture 5

1. $6a(n-1) + a(n+3) + 5a(n+1) = 0$,

→ a. Convert into standard form where $a(n+4)$ is expressed in terms of $a(n+3)$, $a(n+2)$, $a(n+1)$, $a(n)$.

i. replace all n with $n+1$.

$$6a(n) + a(n+4) + 5a(n+2) = 0$$

ii. $a(n+4) = -5a(n+2) - 6a(n)$

b. $$A = \begin{bmatrix} 0 & -5 & 0 & -6 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

$a(0) = 0$, $a(1) = 2$, $a(2) = 3$, $a(3) = 4$

c. i. use Standard form to Find

$a(4) = -5a(2) - 6a(0)$

$= -5$

$a(5) = -5a(3) - 6a(1)$

$= -5(4) - 6(2) = -32$ answer!

ii. use matrix

$$A^2 = \begin{bmatrix} -5 & 0 & -6 & 0 \\ 0 & -5 & 0 & -6 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} 4 \\ 3 \\ 2 \\ 0 \end{bmatrix} = \begin{bmatrix} -32 \\ \vdots \\ \vdots \\ \vdots \end{bmatrix}$$

2.

a. Leslie $A = \begin{bmatrix} 0 & 1.5 & 0.9 & 0.5 & 0.3 \\ 0.8 & 0 & 0 & 0 & 0 \\ 0 & 0.7 & 0 & 0 & 0 \\ 0 & 0 & 0.6 & 0 & 0 \\ 0 & 0 & 0 & 0.6 & 0 \end{bmatrix}$

b.

$A^2 \cdot \begin{bmatrix} 100 \\ 90 \\ 80 \\ 70 \end{bmatrix}$ + extract[1,3]

used Maple

→ 44.1 (statistic expectation)