

Quiz #17

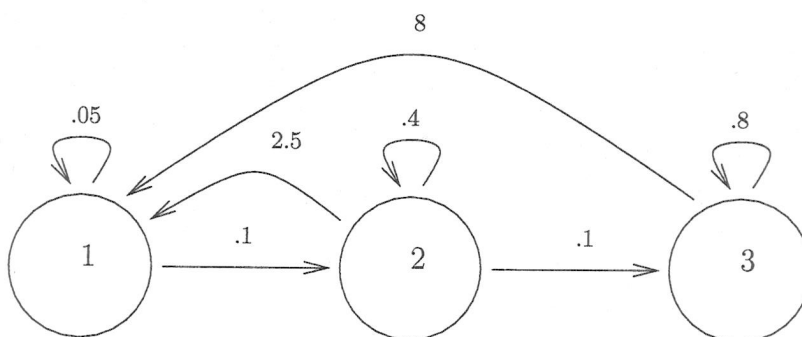
Name: Key

You must show your work to get full credit.

A naturalist taking a census of native rhododendrons (a plant relates to azaleas) can distinguish between three stages of the plant.

- (1) Seedlings,
- (2) Juveniles,
- (3) Mature plants.

The life history is summarized by the following loop diagram.



1. What is the average number of seedlings per year produced by a juvenile.

Average number is 2.5

2. What is the Leslie matrix?

$$A = \begin{bmatrix} .05 & 2.5 & 8 \\ .1 & .4 & 0 \\ 0 & .1 & .8 \end{bmatrix}$$

3. Starting with $\mathbf{n}(0) = \begin{bmatrix} 10 \\ 2 \\ 1 \end{bmatrix}$ compute $\mathbf{n}(30)$ and $\mathbf{n}(31)$ and use these to find the per capita growth rate r . (Be sure to use at least 4 decimal places in your calculations.)

$$\vec{n}(30) = \begin{bmatrix} 25.79113 \\ 4.13451 \\ 1.84740 \end{bmatrix}$$

$$\vec{n}(31) = \begin{bmatrix} 26.40500 \\ 4.23292 \\ 1.89137 \end{bmatrix}$$

$\therefore \lambda = 1+r$

then $\vec{n}(31) = \lambda \vec{n}(30)$

$$r = \frac{.0238}{1} = 2.38\%$$

→ gives 3 equations for λ

$$\lambda = \frac{26.40500}{25.79113} = 1.0238$$

$$\lambda = \frac{4.23292}{4.13451} = 1.0238$$

$$\lambda = \frac{1.89137}{1.84740} = 1.0238$$

$$\text{so } r = \lambda - 1 = .0238$$