Mathematics 172

Quiz # 22 Name: Key

You must show your work to get full credit.

A plant with a three stage growth cycle has Leslie matrix

$$L = \begin{bmatrix} 0.0 & 6.2 & 39.0 \\ 0.35 & 0.0 & 0.0 \\ 0.0 & 0.62 & 0.0 \end{bmatrix}.$$

This plants live on an island and the initial age distribution is

$$\vec{n}(0) = \begin{bmatrix} 210 & 6 & 4 \end{bmatrix}$$

We wish to compute the discrete exponential grow rate λ, the per capita growth rate $r = \lambda - 1$, and the stable age distribution. To do this compute

1.

$$\vec{n}(60) = \begin{bmatrix} 719.6 \\ 24.64 \\ 14.95 \end{bmatrix} \quad \text{and} \quad \vec{n}(61) = \begin{bmatrix} 735.64 \\ 25.18 \\ 15.28 \end{bmatrix}.$$

2. If we have reached the stable age distribution we should have

$$\vec{n}(61) = \lambda \vec{n}(60)$$

this gives three equations for λ. What are the three values we get for lambda?

$\lambda =$ 1.022 $= \frac{735.64}{719.6}$

$\lambda =$ 1.022 $= \frac{25.18}{24.64}$

$\lambda =$ 1.022 $= \frac{15.28}{14.95}$

These agree to three decemial places, so we can consider that we have reached the stable age distribution.

3. What is the stable age distribution?

I used $\vec{n}(60)$

Total = 719.6 + 24.64 + 14.95

= 759.18

Percent in stage 1 94.8 % $= \frac{719.6}{759.18} \times 100$

Percent in stage 2 3.25% $= \frac{24.64}{759.18} \times 100$

Percent in stage 3 1.97 % $= \frac{14.95}{759.18} \times 100$