Mathematics 172

Quiz 19 **Name:** Key

You must show your work to get full credit.

Recall that for the Leslie matrix

$$P = \begin{bmatrix} f_1 & f_2 & f_3 \\ \tau_{1,2} & 0 & 0 \\ 0 & \tau_{2,3} & 0 \end{bmatrix}$$

the Euler-Lotka equation for the finite growth rate, λ, is

$$\frac{f_1}{\lambda} + \frac{\tau_{1,2} f_2}{\lambda^2} + \frac{\tau_{1,2}\tau_{2,3} f_3}{\lambda^3} = 1$$

and the vector

$$\vec{N} = \begin{bmatrix} 1 \\ \frac{\tau_{1,2}}{\lambda} \\ \frac{\tau_{1,2}\tau_{2,3}}{\lambda^2} \end{bmatrix}$$

has the stable age distribution. Let

$$P = \begin{bmatrix} 0.2 & 3.0 & 14.0 \\ 0.1 & 0.0 & 0.0 \\ 0.0 & 0.5 & 0.0 \end{bmatrix}$$

1. What is the Euler-Lotka equation?

The equation is $\frac{.2}{\lambda} + \frac{.3}{\lambda^2} + \frac{.7}{\lambda^3} = 1$

2. Give the finite growth rate, λ, and the per capita growth rate, r, to 3 decimal places.

$\lambda =$ 1.0791 $\qquad r =$ .0791

3. At the stable population distribution give the following

$$\vec{N} = \begin{bmatrix} 1 \\ .0927 \\ .0429 \end{bmatrix}$$

The proportion in Stage is 1 .881

The proportion in Stage is 2 .082

The proportion in Stage is 3 .038