

## Quiz 21

For the Leslie matrix

$$A = \begin{bmatrix} F_1 & F_2 & F_3 \\ P_1 & 0 & 0 \\ 0 & P_2 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 1.5 & 75 \\ .01 & 0 & 0 \\ 0 & .4 & 0 \end{bmatrix}$$

(a) Give the Euler-Lotka equation.

This is  $\frac{F_1}{\lambda} + \frac{F_2 P_1}{\lambda^2} + \frac{F_3 P_1 P_2}{\lambda^3} = 1$

which in our case becomes

$$0 + \frac{(1.5)(.01)}{\lambda^2} + \frac{(75)(.01)(.4)}{\lambda^3} = 1$$

i.e.

$$\frac{.015}{\lambda^2} + \frac{3}{\lambda^3} = 1$$

(b) Find  $\lambda$ . Using the calculator we find

$$\lambda = 1.476911$$

(c) Find the stable age distribution.

This is the vector  $\begin{bmatrix} 1 \\ \frac{P_1}{\lambda} \\ \frac{P_1 P_2}{\lambda^2} \end{bmatrix} = \begin{bmatrix} 1 \\ .067708 \\ .027084 \end{bmatrix}$

changed to a % which is

91.86%  
6.22%  
2.49%