

1. You are studying a population of American toads. This species can live for several years, and breeds once per year.
 - a. Which form of population growth model is more appropriate for this species: **discrete** or continuous?
 - b. Suppose that you count all the toads in the population for two years in a row (2001 and 2002). In the first year there were 1200 toads. In the second year, there were 1100 toads
 - i. What is the value of N_{2001} ? **1200**
 - ii. What is the value of N_{2002} ? **1100**
 - iii. Calculate the total population growth rate ($\Delta N/\Delta t$) **$1100-1200 = -100/\text{yr}$**
 - iv. Calculate the per capita population growth rate ($\Delta N/N\Delta t$)

$$-100/\text{yr}/1200 = -0.083$$
 - v. Calculate the finite rate of increase (N_{t+1}/N_t) **$1100/1200 = 0.92$**
 - vi. What symbol is used to represent the finite rate of increase? **λ**
 - vii. Assuming that per capita growth rate remains constant, how many frogs will be in the population in 2010?

$$N_{2010} = N_{2002} * \lambda^8 = 1100 * 0.92^8 = 565 \text{ toads}$$

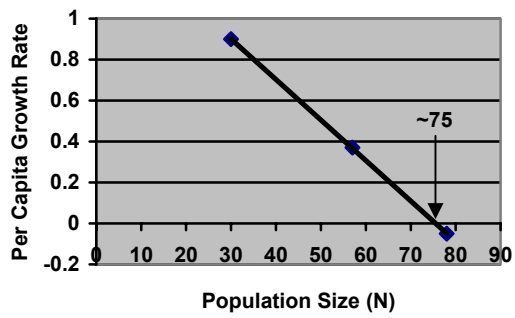
4. Suppose that you have been counting toads in another population for several years, and have collected the data below.

Year (t)	N_t	Total Growth	Per capita growth	λ
1998	30	$57-30 = 27$	$27/30 = 0.90$	$57/30 = 1.90$
1999	57	21	0.37	1.37
2000	78	-4	-0.05	0.95
2001	74	----	-----	-----

- a. Calculate per capita growth rate and λ for each year
- b. Does the population appear to be growing exponentially?

No -- per capita growth rate is not constant over time

- c. Graph per capita growth rate versus N on graph paper. Use a ruler to draw a line through the points.



d. What is the equilibrium density (the value of N where $\Delta N/N\Delta t = 1$)?
(give a number)

about 75 toads

e. Is this equilibrium stable or unstable?

Stable -- when population is below the equilibrium density it grows; when it is above the equilibrium it shrinks