

Mathematics 172

Quiz #8

You must show your work to get full credit.

Consider a population growing logistically with a carry complicity of 100 and an intrinsic growth rate of $r = .02$ (individuals/year)/individual.

- (1) Write down the rate equation for this growth.

Solution.

$$\frac{dN}{dt} = .02N \left(1 - \frac{N}{K} \right).$$

where N is the number of individuals in the population at time t and t is time in years. □

- (2) If the population has size 150 at what rate is it changing?

Solution. The rate of change is just the derivative $\frac{dN}{dt}$, which is given by the rate equation above. So we just plug $N = 150$ into this equation

$$\left. \frac{dN}{dt} \right|_{N=150} = .02(150) \left(1 - \frac{150}{100} \right) = -1.5 \text{ individuals/year}$$

□

- (3) What is the per capita growth rate when $N = 150$?

Solution. This is just the total growth rate divided by the population size.

That is $\frac{1}{N} \frac{dN}{dt}$. In our case

$$\left. \frac{1}{N} \frac{dN}{dt} \right|_{N=150} = \frac{1}{150}(-1.5) = -.01$$

□