

Mathematics 172

Quiz #9

You must show your work to get full credit.

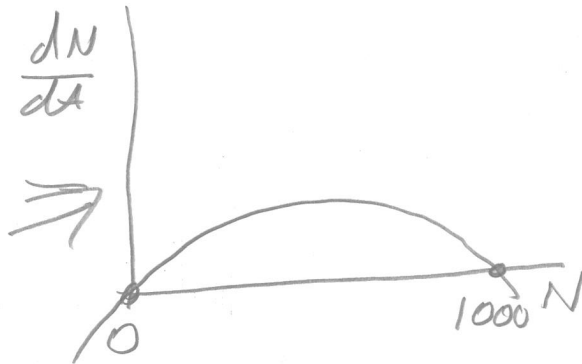
For a population of guppies grows logistically with an intrinsic growth rate of $r = .06$ (fish/week)fish and a carrying capacity of 1,000 fish.

(1) What population size maximizes the growth rate of the population?

If N is the number of guppies and t is the time in weeks, then the growth rate is $\frac{dN}{dt}$. This is given by the logistic equation

$$\frac{dN}{dt} = .06N \left(1 - \frac{N}{1000}\right)$$

(graph of $\frac{dN}{dt}$ as a function of N)



This graph is a parabola opening down
so the high point is half way between the zeros, i.e.

(2) What is the maximum growth rate?

$$N = 500$$

Just plug $N = 500$ back into the equations

$$\begin{aligned} \frac{dN}{dt} &= .06(500) \left(1 - \frac{500}{1000}\right) \\ &= 15 \text{ fish/week.} \end{aligned}$$