

Quiz #9

Name: Key*You must show your work to get full credit.*

Health authorities release 50 mosquito fish in an abandoned swimming pool. The population grows logistical with an intrinsic growth rate of $r = 0.2$ (fish/fish)week) and carrying capacity of 1,000 fish. Let $N = N(t)$ be number of fish in the pool t weeks after the original fish were released.

1. Write down the corresponding logistic equation.

$$\frac{dN}{dt} = .2N \left(1 - \frac{N}{1000}\right)$$

2. What is the initial growth rate (that is $\frac{dN}{dt}$) of the population when it was first released.

Growth rate is 9.5 fish/week

$$\left. \frac{dN}{dt} \right|_{t=0} = N'(0) = .2(50) \left(1 - \frac{50}{1000}\right) = 9.5$$

3. Estimate $N(100)$. we will have $N(100) \approx$ 1000 fish
 reached the carrying capacity
 by $t=100$. so $N(100) \approx 1000$

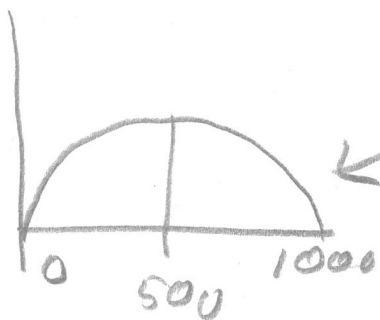
4. What is the growth rate when $N = 800$? Growth rate is 32 fish/week

$$\left. \frac{dN}{dt} \right|_{N=800} = .2(800) \left(1 - \frac{800}{1000}\right) = 32$$

5. What value of N maximizes the growth rate and what is the maximum growth rate?

Maximizing N is 500

Maximum growth rate is 50



max is at $\frac{1000}{2} = 500$

$$\left. \frac{dN}{dt} \right|_{N=500} = .2(500) \left(1 - \frac{500}{1000}\right) = 50$$