Mathematics 172

Quiz # 11 Name: key

You must show your work to get full credit.

A population of snails is growing logistically in an aquarium with an intrinsic growth rate of $r = .13$ (snails/week)/snail. The carrying capacity of the aquarium is $K = 60$. Let $N(t)$ be the number of snails after t weeks.

1. Write down the rate equation for $N(t)$.

Rate equation is: $\frac{dN}{dt} = .13N\left(1 - \frac{N}{60}\right)$

2. If $N(0) = 45$ estimate the number of snails in

$N'(0) = .13(45)\left(1 - \frac{45}{60}\right) = 1.4625$

One week: $N(1) \approx$ 46.4625

One half week: $N(.5) \approx$ 45.76321

$N(1) \approx N(0) + 1N'(0) = 45 + 1.4625 = 46.4625$

$N(.5) = 45 + (.5)(1.46425) = 45.7321$

3. A pair of dwarf gourami (a type of fish from South Asia). They eat snails at a rate of 10% of the current population size.

What is the new rate equation for N? $\frac{dN}{dt} = .13N\left(1 - \frac{N}{60}\right) - .1N$

What is the new carrying capacity? _____

→ Find the new equilibria $\frac{dN}{dt} = .13N\left(1 - \frac{N}{60}\right) - .1N = 0$

$N\left(.13\left(1 - \frac{N}{60}\right) - .1\right) = 0$

$N = 0$, $.13\left(1 - \frac{N}{60}\right) - .1 = 0$

$.13 - \frac{.13N}{60} - .1 = 0$

$\frac{.13N}{60} = .03$

$N = \left(\frac{.03}{.13}\right)60 = 13.85$