Mathematics 172

Quiz 13 **Name:** Key

You must show your work to get full credit.

1. A lake is with trout is fished so that the intrinsic growth rate of the fish is $r = -.8$ fish/year. The department of natural resources want to keep a stable population of 5,000 fish in the lake. At what rate should they stock the lake?

Stocking rate is 4000

Equation is $\frac{dP}{dt} = -.8P + S$ where S is stocking rate.

want $-.8(5000) + S = 0$ so $S = .8(5000) = 4000$

2. A population of paramecium lives is an acorn filled with water. The population grows logistically with $r = .9$ (paramecium/day)/paramecium and a carrying capacity of $K = 500$.

(a) What is the rate equation satisfies satisfied by the population size $P(t)$.

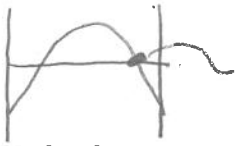
The equation is $\frac{dP}{dt} = .9P\left(1 - \frac{P}{500}\right)$

(b) A few rotifers invade the acorn and eat the paramecium at a constant rate of 50 paramecium/day. What is the new rate equation?

The rate equation is $\frac{dP}{dt} = .9P\left(1 - \frac{P}{500}\right) - 50$

(c) What is the new stable population size of the paramecium population?

Stable population size is 436.3



3. With the same set up as the previous problem instead of being invaded my a predator assume that a virus invades the population and kills off 30% of the population per day.

(a) What is the new rate equation?

The equation is $\frac{dP}{dt} = .9P\left(1 - \frac{P}{500}\right) - .3P$

(b) What is the new stable population size?

Stable population size is 277.8