Mathematics 172

Quiz #27 Name: Key

You must show your work to get full credit.

Snails (the predator) in an aquarium feed on algae (the victims). If V is the amount of algae in grams and P is the number of snails we assume that the following Lotka-Volterra system is satisfied:

$$\frac{dV}{dt} = .4V - .01VP = V(.4 - .01P)$$
$$\frac{dP}{dt} = -.3P + .006VP = P(-.3 + .006V)$$

where time t is measured in months.

1. If we start with 60 grams of algae and 20 snails compute $V'(0)$ and $P'(0)$ and use these to write a sentence or two describing the initial behavior of the system.

$V'(0) =$ 12 grams algae/mon $P'(0) =$ 1.2 snails/mon

$V'(0) = 60(.4 - .01(20)) = 12$

$P'(0) =$

2. Find the average amount, $\widehat{V}$, of algae, the average number of snials, $\widehat{P}$, and use this to the phase space complete with a couple of loops and arrows showing which way things are moving.

$\widehat{V} =$ 50 $\widehat{P} =$ 40

solve

$\frac{dV}{dt} = V(.4 - .01P) = 0$

To get

$\widehat{P} = \frac{.4}{.01} = 40$

solve

$\frac{dP}{dt} = P(-.3 + .006V) = 0$

$\widehat{V} = \frac{.3}{.006} = 50$