Mathematics 172

Quiz #29 Name: Key

You must show your work to get full credit.

Consider the predator-prey, or in the books terminology, predator-victim system

$$\frac{dV}{dt} = .015V\left(1 - \frac{V}{300}\right) - .0002VP = V\left(.015 - \frac{.15V}{300} - .0002P\right)$$

$$\frac{dP}{dt} = -.1P + .001VP = P(-.1 + .001V)$$

where in this case the victim population grows logistically in the absence of the predators.

1. If there are no predators present, that what is the carrying capacity of the populations of victims?

Carrying capacity is $K = 300$

2. Find the equilibrium points of the systems.

Equilibrium points are $(V, P) =$ $(0,0)$, $(300,0)$, $(100,50)$

We know that $(0,0)$ and $(K,0) = (300,0)$ are eq. pts.

For the third one solve

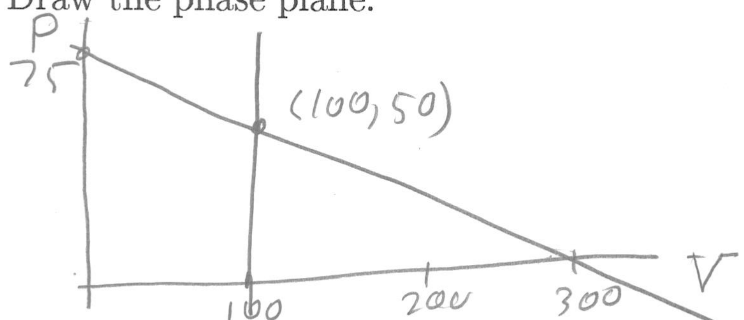
$$\frac{.015V}{300} + .0002P = .015$$

$$.001V = .1 \rightarrow V = \frac{.1}{.001} = 100$$

use this in the first eqn to get

$$P = \left(.015 - \frac{.015(100)}{300}\right)/.0002 = 50$$

3. Draw the phase plane.



4. What happens to the two populations in the long run?

V stablizes at $\hat{V} = 100$ and P stablizes at $\hat{P} = 50$