Mathematics 172

Quiz #30 Name: key

You must show your work to get full credit.

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

$$\frac{dV}{dt} = .015V\left(1 - \frac{V}{200}\right) - .0001VP$$

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

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

1. Find the equilibrium points of the systems.

we know that (0,0), (200,0) are eqm. pts. To find the third one solve

$.015\left(1 - \frac{V}{200}\right) - .0001P = 0$

$-.1 + .001V = 0$

The second implies

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

use this in the first one

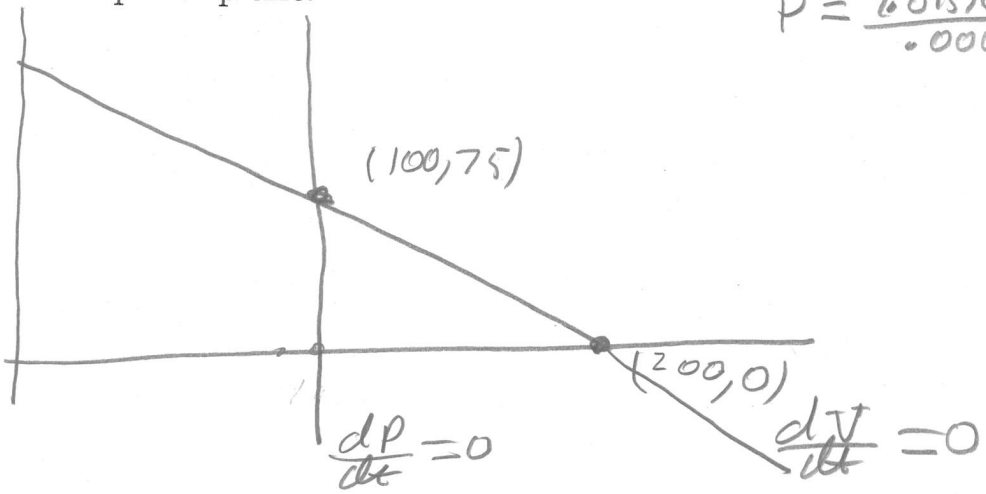
$.015\left(1 - \frac{100}{200}\right) - .0001P = 0$

$.0001P = (.015)(.5)$

$P = \frac{(.015)(.5)}{.0001} = 75$

Equilibrium points are $(V, P) =$ (0,0), (200,0), (100,75)

2. Draw the phase plane.



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

The victim population stabilizes at $\hat{V} = 100$

The predator population stabilizes at $\hat{P} = 75$