Mathematics 172

Quiz 18 Name: Key

You must show your work to get full credit.

A population of tilapia is being raised in a pond. Assume that they are being harvested for food at such a rate that the intrinsic growth rate is $r = -.1$ (fish/month)/fish. It is desired to have a stable population of 1,000 tilapia in the pond. At what rate should the pond be stocked to insure this is the case.

The stocking rate is 100 fish/month.

Let $P(t)$ = population size after t months.

Let S be the stocking rule in fish/months.

Then

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

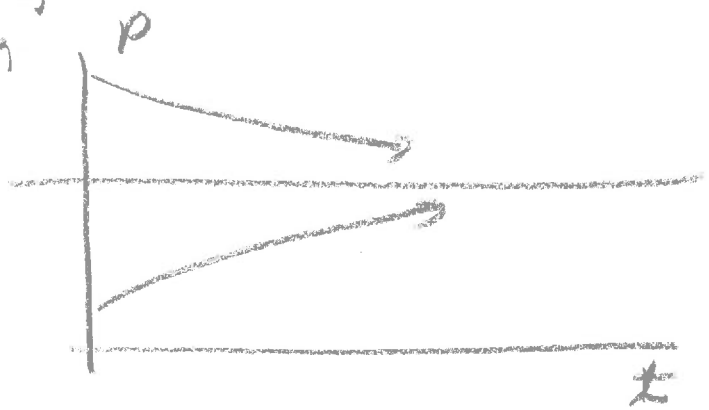
We wish $P = 1{,}000$ to be a stable equilibrium point. So $P = 1{,}000$ is a solution. For this solution $\frac{dP}{dt} = 0$.

Thus we set the equation

$$0 = -.1(1{,}000) + S$$

so $$S = .1(1{,}000) = 100.$$

From the graph



for $S = 100$

$$\frac{dP}{dt} = -.1P + 100$$

we see this is stable