Mathematics 172

Quiz 6 Name: Key

You must show your work to get full credit.

1. A population of mosquito fish lives a pond with some bass that feed on them. Because of the bass the intrinsic growth rate of the population of mosquito is $r = -.12$ (fish/week)/fish. The owner of the pond wants to have a stable population of 2,000 mosquito fish in the pond to control mosquitoes. At what rate should he stock the pond?

Let $N(t)$ = number of mosquito fish in week t and S = stocking rate. Then

$$\frac{dN}{dt} = -.12N + S$$

we wish $N = 2{,}000$ to be an equilibrium point → use this in the equation to get

$$0 = -.12(2{,}000) + S$$

so

$$S = (.12)(2000) = 240 \text{ fish/week}$$

Stocking rate is: 240 fish/week

2. Let $N(t)$ be the number of grams of algae in an aquarium. Assume that the algae grows logistically with an intrinsic growth rate of $r = .25$ (grams/week)/gram and a carrying capacity of $K = 50$ grams. To control the algae a snail is put into the aquarium.

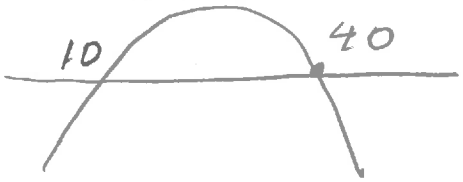
(a) What happens if the snail eats 2 grams/week of the algae?

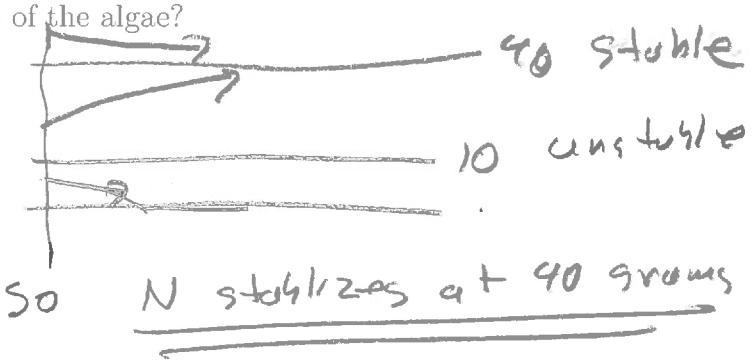
In this case

$$\frac{dN}{dt} = .25N\left(1 - \frac{N}{50}\right) - 2$$

Plot Y1 = .25X(1 − X/50) − 2

$X_{min} = 0$, $X_{max} = 50$





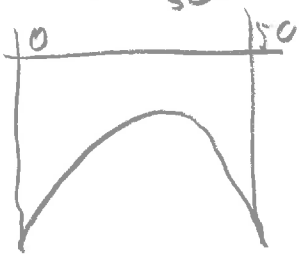
N stabilizes at 40 grams

(b) What happens if the snail eats 4 grams/week of the algae?

This time

$$\frac{dN}{dt} = .2N\left(1 - \frac{N}{50}\right) - 4$$

Graph is



so no equilibrium points and all algae is removed from tank