Mathematics 172

Quiz #4

You must show your work to get full credit.

A population of tilapia is harested so that it has a growth rate of $r = -.05$ (fish/week)fish.

(a) If the population is stocked at the rate of 20 fish/weel, what is the size of the stable population?

(b) At what rate should the population be stocked to give a stable population of 150?

Solution for (a): If S is the stocking rate, then population size, N_t, satisfies

$$N_{t+1} = (1 + r)N_t + S.$$

In our case $r = -.2$ and $S = 20$, so this becomes

$$N_{t+1} = .8N_t + 20.$$

When the population reaches its stable size, we have $N_{t+1} = N_t$ and thus

$$N_t = .8N_t + 20$$

which is the same as $.2N_t = 20$ and thus the stable population size is

$$N_t = \frac{20}{.2} = 100.$$

Solution for (b): The set up is the same, other than we don't know the stocking rate S. So the equation is

$$N_{t+1} = .8N_t + S.$$

To get the stable population size, we set $N_{t+1} = N_t$ and solve:

$$N_t = .8N_t + S$$

which has the solution

$$N_t = \frac{S}{.2}.$$

As we want this to be 150 we set

$$\frac{S}{.2} = 150$$

so the stocking rate is

$$S = (.2)150 = 30$$