

You must show your work to get full credit.

A population of fish grows logistically with intrinsic growth rate .25 (fish/yr)/fish and carrying capacity of 5,000 fish.

1. If the fish are harvested at a continuous rate of 200 fish/yr, then what is the new stable population size?

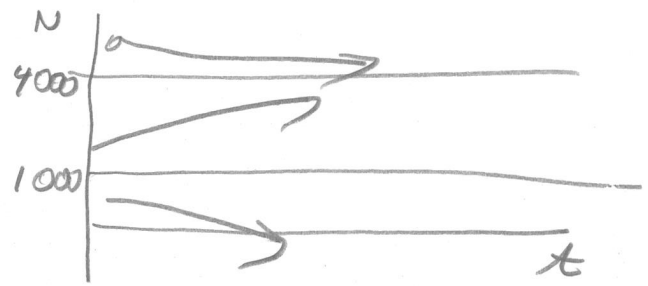
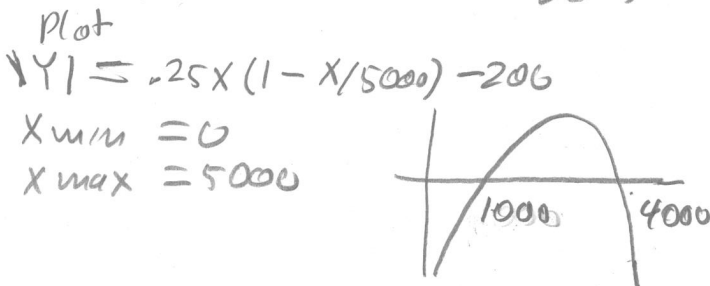
The logistic equation is

New population size is 4000

$$\frac{dN}{dt} = .25N\left(1 - \frac{N}{5000}\right)$$

Once the harvesting starts the equation is

$$\frac{dN}{dt} = .25N\left(1 - \frac{N}{5000}\right) - 200$$



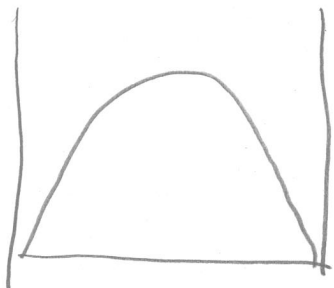
2. What is the maximum rate at which the population can be harvested without it dying out?

Maximum harvesting rate is 312.5

This time plot

$$Y = .25X\left(1 - \frac{X}{5000}\right)$$

$X_{min} = 0$
 $X_{max} = 5000$



and find the maximum

$$X = 2500$$

$$Y = 312.5 \leftarrow \text{This is the one you want}$$