Quiz 6   Name: **Answer Key**

You must show your work to get full credit.

A population of guppies grows logistically in a tank with an intrinsic growth rate of $r = .5$ (fish/fish)/week and a carrying capacity of $K = 200$ fish. Let $N(t)$ be the number of guppies in the tank after t weeks.

1. What is the rate equation satisfied by N?

$$\text{The equation is:} \quad \frac{dN}{dt} = .5N\left(1 - \frac{N}{200}\right)$$

2. At some point the owner of the aquarium starts harvesting the guppies at a rate of 15 fish/week to feed to her pet oscar.


A guppy eating oscar (Astronotus ocellatus, a cichlid from South America).

What is the new rate equation satisfied by N?

$$\text{New rate equation is:} \quad \frac{dN}{dt} = .5N\left(1 - \frac{N}{200}\right) - 15$$

3. What is the new stable population size in the tank of guppies? Draw a picture showing how you found this population size.

Graphing $\dfrac{dN}{dt}$ as a function of N gives the graph to the right. Using the calculator to solve for the zeros gives that the equilibrium points are 36.754 and 163.246
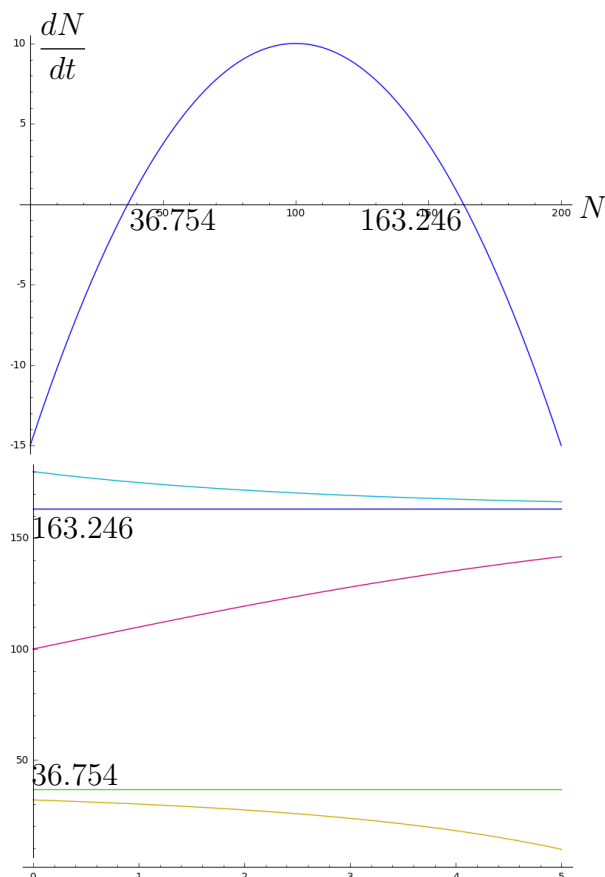
Graphing N as a function of t now shows that 163.246 is stable.

Stable population size is: ___163.246___