Mathematics 172

Quiz 7 Name: Key

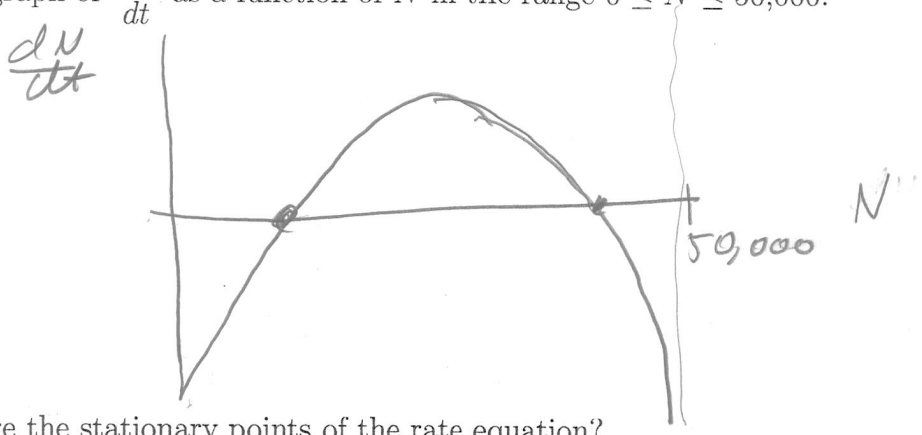
You must show your work to get full credit.

Shrimp are being raised in bay. Initially the population grows logistically with intrinsic growth rate of $r = .2$ (shrimp/mon)/shrimp and a carrying capacity of $K = 50{,}000$ shrimp. Once the population of shrimp is well established they are harvested at a rate of 1,500 shrimp/mon.

(1) Let $N(t)$ be the size of the population of shrimp t months after the harvesting starts. Write the rate equation for N.

$$\frac{dN}{dt} = .2N\left(1 - \frac{N}{50{,}000}\right) - 1{,}500$$

(2) Give a graph of $\frac{dN}{dt}$ as a function of N in the range $0 \le N \le 50{,}000$.

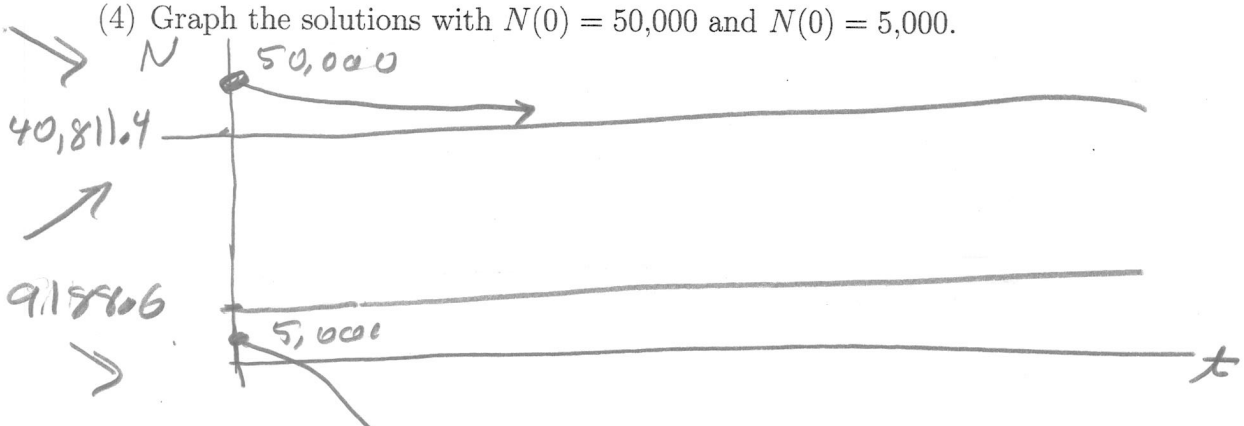


(3) What are the stationary points of the rate equation?

Used $Y_1 = .2 * X * (1 - X/50000) - 1500$ and 2nd calc to find zeros.

Stationary points are: $N = 9188.6$, $N = 40811.4$

(4) Graph the solutions with $N(0) = 50{,}000$ and $N(0) = 5{,}000$.



(5) What is the stable population size?

Stable population size is $N =$ 40,811.