Mathematics 172

Quiz 17 Name: Key

You must show your work to get full credit.

Let $A(t)$ be the number of grams of algae in a tank after t days. Assume that the algae grows according to the logistic rate equation with intrinsic growth rate $r = .04$ (g algae/day)/(g algae) and carrying capacity $K = 500$ g algae.

1. What is the rate equation satisfied by A? (Recall that an equation has an equal sign in it, so don't forget that.)

The logistic equation is $\frac{dA}{dt} = rA\left(1 - \frac{A}{K}\right)$

In our case $r = .04$

$K = 500$

The rate equation is $\frac{dA}{dt} = .04A\left(1 - \frac{A}{500}\right)$

or $A' = .04A\left(1 - \frac{A}{500}\right)$

2. If $A(10) = 450$, what is $A'(10)$?

$A'(10) =$ 1.8 gram/day

$A'(10) = .04A(10)\left(1 - \frac{A(10)}{500}\right)$

$= .04(450)\left(1 - \frac{450}{500}\right)$

$= 1.8$

3. If $A(10) = 450$ estimate $A(10.5)$.

$A(10.5) \approx$ 450.9

$A(10.5) \approx A(10) + A'(10)(.5)$

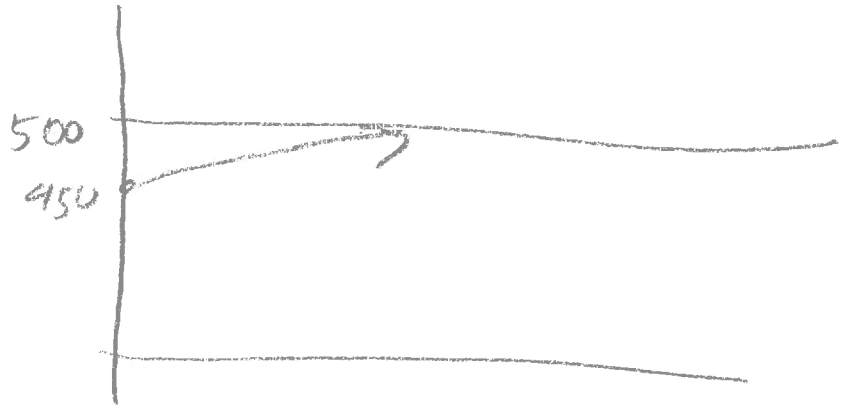
$= 450 + 1.8(.5)$

$= 450 + .9$

$= 450.9$

4. If $A(10) = 450$ estimate $A(200)$.

$A(200) \approx$ 500



The carrying capacity $K = 500$ is a stable equm. pt. so $A(200) \approx 500$