Mathematics 172

Quiz 7 Name: Key

You must show your work to get full credit.

1. A population of algae is growing logistically in a aquarium with $r = .1$ (grams/gram)/week and a carrying capacity of $K = 500$ grams. What is the minimum rate that he can harvest the algae to guarantee to eradicate the algae population. Draw a picture to illustrate your answer.

The minimum rate is: 12.5 grams/week

The logistic equation is

$\frac{dP}{dt} = .1P(1 - \frac{P}{500})$ where $P(t)$ = number of grams of algae in week t

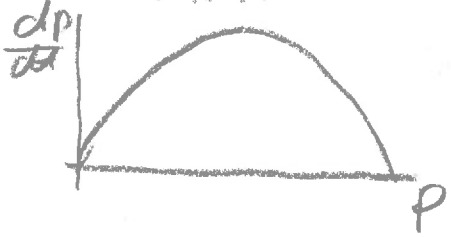
Graph $\frac{dP}{dt}$ as a function of P

$Y1 = .1X(1 - X/500)$

$X_{min} = 0$

$X_{max} = 500$

0:ZoomFit



Find the maximum of $\frac{dP}{dt}$ which is 12.5.

So the minimum harvesting 12.5 grams algae/week

2. Let N_t be defined by

$$N_{t+1} = \frac{2N_t}{1 + .1N_t^2}, \qquad N_0 = 5.$$

Find the following

$N_1 = \frac{2(5)}{1 + .1(5)^2} = 2.857$

$N_1 =$ 2.857

$N_2 = \frac{2(2.857)}{1 + .1(2.857)^2} = 3.146$

$N_2 =$ 3.146

$N_3 = \frac{2(3.146)}{1 + .1(3.146)^2} = 3.162$

$N_3 =$ 3.162