Mathematics 172

Quiz 4   Name:_____Key_____

You must show your work to get full credit.

1. Assume that a population is modeled by the logistic model

$$N_{t+1} = N_t + 1.1N_t \left(1 - \frac{N_t}{2,000}\right)$$ (∗)

where N_t number of individuals and the carrying capacity is $K = 2,000$. Both so that we can work with smaller numbers, and also it has natural biological meaning let

$$P_t = \frac{N_t}{2,000}$$

be the proportion of carrying carrying capacity. Find the difference equation for P_t

$$P_{t+1} = \underline{P_t + 1.1\, P_t\, (1 - P_t)}$$

Then $N_t = 2,000\, P_t$. Put this in the equation (∗)

$$2,000\, P_{t+1} = 2000\, P_t + 1.1\, (2,000\, P_t)\left(1 - \frac{2000\, P_t}{2,000}\right)$$

$$= 2,000\left(P_t + 1.1\, P_t\, (1 - P_t)\right)$$

Divide by 2,000

$$P_{t+1} = P_t + 1.1\, P_t\, (1 - P_t)$$