Mathematics 172

Quiz 8 Name: Key

You must show your work to get full credit.

1. A population of annual plants is introduced to an island. Assume the initial number introduced is $N_0 = 12$ and that the population grows by 8% a year. Let N_t be the number of plants on the island t years after the introduction.

(a) Give a formula for N_{t+1} in terms of N_t. $N_{t+1} =$ $(1.08)N_t$

$$N_{t+1} = N_t + 8\% \text{ of } N_t$$
$$= N_t + .08N_t$$
$$= (1.08)N_t$$

(b) Give a formula for N_t. $N_t =$ $12(1.08)^t$

$$N_t = N_0(1.08)^t$$
$$= 12(1.08)^t$$

(c) What is the population size after 30 years? $N_{30} =$ 120.75

$$N_{30} = N_0(1.08)^{30} = 120.75$$

2. Let P_t be the population size of some annual cicadas in a park t years after the park is opened. Assume the initial population size is $P_0 = 1{,}500$ cicadas and that P_t satisfies

$$P_{t+1} = P_t + .05P_t\left(1 - \frac{P_t}{2{,}000}\right).$$

(a) What are P_1 and P_2? $P_1 =$ 1518.75 $P_2 =$ 1537.02

$$P_1 = P_0 + .05P_0\left(1 - \frac{P_0}{2000}\right)$$
$$= 1500 + .05(1500)\left(1 - \frac{1500}{2000}\right)$$
$$= 1518.75$$
$$P_2 = P_1 + .05P_1\left(1 - \frac{P_1}{2000}\right)$$
$$= 1518.75 + .05(1518.75)\left(1 - \frac{1518.75}{2000}\right)$$
$$= 1537.02$$