Quiz 16 Name: __Key__

You must show your work to get full credit.

1. Define P_t by

$$P_{t+1} = P_t + .1P_t\left(1 - \frac{P_t}{10}\right) \qquad P_0 = 12$$

Compute P_1 and P_2.

$P_1 = $ __11.76__ $P_2 = $ __11.5530024__

$P_1 = P_0 + .1P_0\left(1 - \frac{P_0}{10}\right) = 12 + .1(12)\left(1 - \frac{12}{10}\right) = 11.76$

$P_2 = P_1 + .1\,P_1\left(1 - \frac{P_1}{10}\right) = 11.76 + .1(11.76)\left(1 - \frac{11.76}{10}\right)$

$\qquad = 11.5530024$

2. 20 killifish are released in a pond. Killifish breed just once a year and die after breeding. Assume that for the first 50 years the fish have unconstrained growth with a per capita growth rate of $r = .1$ fish/fish.

(a) What is the growth ratio? $\lambda = $ __1.1__

$\lambda = 1 + r = 1.1$

(b) Give a formula for the number, N_t, after t years.

$N_t = N_0\lambda^t = 20(1.1)^t$ $N_t = $ __$20(1.1)^t$__

(c) How many days until there are 1,000 fish?

Solve $t = $ __41.045 years__

$N_t = 20(1.1)^t = 1000$

$(1.1)^t = 1000/20$

$t\ \ln(1.1) = \ln(1000/20)$

$t = \dfrac{\ln(1000/20)}{\ln(1.1)} = 41.045$