Mathematics 172

Quiz 9 Name: Key

You must show your work to get full credit.

A garden is abandoned with 10 pea plants left in it. Peas are an annual plant. After 3 years someone finds that there are 18 pea plants in the garden.

1. What are the growth ratio, λ, and per capita growth rate of this population of peas?

$\lambda =$ 1.216 plants/plant $\qquad r =$ .216 plants/plant

Let N_t = number of plants in year t.

Then $N_{t+1} = \lambda N_t$ and

$N_t = N_0 \lambda^t = 10\lambda^t$

$N_3 = 10\lambda^3 = 18$

$\lambda^3 = 1.8$

$\lambda = (1.8)^{\frac{1}{3}} = 1.216$

$r = \lambda - 1 = .216$

2. If N_t is the number of peas in the garden after t years, give a formula for N_t.

$N_t = N_0\lambda^t$

$= 10(1.216)^t$

$N_t =$ $10(1.216)^t$

3. How long before there are 100 pea plants in the garden?

Number of years until a 100 plants 11.77 years, but to get 100 we need to wait to year 12.

We need to solve

$N_t = 10(1.216)^t = 100$

$(1.216)^t = 10$

$t \ln(1.216) = \ln(10)$

$t = \frac{\ln(10)}{\ln(1.216)} = 11.77$