Mathematics 172

Quiz 7 Name: Key

***You must show your work to get full credit.***

A farmer with a small pond stocks it with 20 bluegill (a type of fish that breeds just once a year). Two years later there are 35 bluegill in the pond. Assuming that the growth is exponential

1. Find the growth factor $\lambda$ and the per capita growth rate $r$. $\lambda =$ 1.3223 fish/fish

$r =$ .3223 fish/fish

Let $N_t$ = number of bluegill after $t$ years. Then

$$N_t = N_0\lambda^t = 20\lambda^t$$

We know $N_2 = 35$ so

$$N_2 = 20\lambda^2 = 35$$

$$\lambda^2 = 35/20$$

$$\lambda = (35/20)^{\frac{1}{2}} = (35/20)\,\hat{}\,(1/2) = 1.3223$$

Therefore

$$r = \lambda - 1 = .3223$$

2. How many years until there are 500 bluegill in the pond.

Number of years until 500 is 11.522 years.

We need to solve

$$N_t = 20(1.3223)^t = 500$$

$$(1.3223)^t = \frac{500}{20}$$

$$t\ln(1.3223) = \ln\left(\frac{500}{20}\right)$$

$$t = \ln(500/20)/\ln(1.3223)$$

$$= 11.522 \text{ years}$$