

Quiz #7

Name: Key

You must show your work to get full credit.

It is known that the size, N , of a population of guppies (a type of small fast breeding fish) satisfies

$$\frac{dN}{dt} = rN$$

where r is a constant and t is measured in months. The initial population size was 25 and three months later there are 125.

1. Find the constant r .

$$N(t) = N_0 e^{rt} = 25e^{rt}$$

$$N(3) = 25e^{3r} = 125$$

$$e^{3r} = 125/25$$

$$r = \underline{.5365}$$

$$\rightarrow 3r = \ln(125/25)$$

$$r = \ln(125/25)/3 = .5365$$

2. Give a formula for the number, $N(t)$, of guppies after t months.

$$N(t) = N_0 e^{rt} = N(t) = \underline{25 e^{.5365t}} \text{ guppies}$$

3. How long until there are a million guppies?

19.75 months

Solve

$$25 e^{.5365t} = 1,000,000$$

$$e^{.5365t} = 1,000,000/25$$

$$.5365t = \ln(1,000,000/25)$$

$$t = \frac{\ln(1,000,000/25)}{.5365} = 19.75$$