Mathematics 172

Quiz #2 Name: Key

You must show your work to get full credit.

Let a population grow with a constant intrinsic growth rate of ρ. The initial size of the population is 100 and after five years it is 300.

(1) Give a rate equation for the size, $P = P(t)$ after t years. (This will involve the intrinsic growth rate, ρ, as a parameter.)

1 pt $\frac{dP}{dt} = \rho P$

But as I had been vague about what I wanted here $P = 100e^{\rho t}$ also got full credit.

(2) Find the intrinsic growth rate, ρ. $\rho =$ .2197

2 pts Want

$$P(5) = 100e^{\rho \cdot 5} = 300$$
$$e^{5\rho} = 3$$
$$5\rho = \ln(3)$$
$$\rho = \frac{\ln(3)}{5} = .2197$$

(3) How long does it take the population to reach 1,000?

2 pts Want to solve $P(t) = 100e^{.2197t} = 1{,}000$ 10.48

$$e^{.2197t} = 10$$
$$.2197t = \ln(10)$$
$$t = \frac{\ln(10)}{.2197}$$