Mathematics 172

Quiz 32 **Name:** Key

You must show your work to get full credit.

We have a population of some organisms and the size of the population grows exponentially.

1. Assume that the organism is an annual cicada so that there is exactly one generation per year. Assume the annual per capita growth rate is 1.1 cicadas/cicada.

(a) Should this be modeled by a difference equation or a rate equation?

difference or rate? difference

(b) What is this equation? Equation is $\Delta P = 1.1P$

(c) If we start with a population of 100 cicadas for the size of the population after t years.

$P_t = P_0 \lambda^t$
$= P_0(1+r)^t$
and $r = 1.1$

Population size is $100(2.1)^t$

(d) What is the population after 20 years? Population size is 2.7821×10^8

$P_{20} = 100(2.1)^{20} =$

2. This time assume that our organism is a populations of guppies, a type of fish that breeds continuously. Assume that the intrinsic growth rate is 1.1 (guppies/guppy)/year.

(a) Should this be modeled by a difference equation or a rate equation?

difference or rate? (rate)

(b) What is this equation? Equation is $\frac{dP}{dt} = 1.1P$

(c) If we start with a population of 100 cicadas for the size of the population after t years.

$P(t) = P_0 e^{rt}$
$= 100 e^{1.1t}$

Population size is $100 e^{1.1t}$

(d) What is the population after 20 years? Population size is 1.739×10^{20}