7.9 Logistic Models

Calculus Name: ______________________________

CA #2

1. A populations rate of growth is modeled by the logistic differential equation $\frac{dP}{dt} = \frac{1}{400}P(100 - P)$, where t is in days and $P(0) = 10$. What is the greatest rate of change for this population?

2. Using the logistic differential equation $\frac{dP}{dt} = \frac{1}{3}P - \frac{1}{120}P^2$, what is $\lim_{t\to\infty} P(t)$?

3. A rate of change $\frac{dP}{dt}$ of a population is modeled by a logistic differential equation. If $\lim_{t\to\infty} P(t) = 100$ and the rate of change of the population is 5 when the population size is 20, which of the following differential equations describe the situation?

A. $\frac{dP}{dt} = 5P\left(1 - \frac{P}{20}\right)$

B. $\frac{dP}{dt} = 20P\left(1 - \frac{P}{100}\right)$

C. $\frac{dP}{dt} = \frac{5}{16}P\left(1 - \frac{P}{100}\right)$

D. $\frac{dP}{dt} = \frac{16}{5}P\left(1 - \frac{P}{100}\right)$

4. A rate of change for a population is modeled by the differential equation $\frac{dP}{dt} = 0.3P(66 - P)$. What is the population when the rate of change is the greatest?

5. Which of the following is a logistic differential equation?

A. $\frac{dP}{dt} = 3t(1 - t)$

B. $\frac{dP}{dt} = 3P(1 - t)$

C. $\frac{dP}{dt} = \frac{1}{3}P\left(1 - \frac{t}{50}\right)$

D. $\frac{dP}{dt} = \frac{1}{3}P\left(1 - \frac{P}{50}\right)$

Answers to 7.9 CA #2

1. $\frac{25}{4}$ per day	2. 40	3. C	4. 33	5. D