7.9 Logistic Models

Calculus Name: ______________________________ **CA #1**

1. A populations rate of growth is modeled by the logistic differential equation $\frac{dP}{dt} = \frac{1}{1000}P(600 - P)$, where t is in days and $P(0) = 60$. What is the greatest rate of change for this population?

2. Using the logistic differential equation $\frac{dP}{dt} = \frac{1}{5}P - \frac{1}{2000}P^2$, identify the carrying capacity.

3. A rate of change $\frac{dP}{dt}$ of a population is modeled by a logistic differential equation. If $\lim_{t \to \infty} P(t) = 1000$ and the rate of change of the population is 100 when the population size is 50, which of the following differential equations describe the situation?

   A. $\frac{dP}{dt} = 50P\left(1 - \frac{P}{1000}\right)$

   B. $\frac{dP}{dt} = 100P\left(1 - \frac{P}{1000}\right)$

   C. $\frac{dP}{dt} = \frac{19}{40}P\left(1 - \frac{P}{1000}\right)$

   D. $\frac{dP}{dt} = \frac{40}{19}P\left(1 - \frac{P}{1000}\right)$

4. A rate of change for a population is modeled by the differential equation $\frac{dP}{dt} = \frac{1}{5}P(40 - P)$. What is the population when the rate of change is the greatest?

5. Let k be a positive constant. Which of the following is a logistic differential equation?

A. $\frac{dy}{dt} = kt + C$

B. $\frac{dy}{dt} = ky$

C. $\frac{dy}{dt} = kt(2 - t)$

D. $\frac{dy}{dt} = ky(2 - y)$

Answers to 7.9 CA #1

1. 90/day	2. 400	3. D	4. 20	5. D