7.8 Exponential Models with Differential Equations

CA #1

Calculus Name: ______________________________

Find the particular solution $y = f(t)$ for each differential equation.

1. $\frac{dy}{dt} = 106y$ and $y = -15$ when $x = 0$, then $y =$

2. $\frac{dy}{dx} = -0.3y$ and $y = 41$ when $x = 0$, then $y =$

3. $\frac{dy}{dt} = 51y$ and $y = -0.5$ when $x = 0$, then $y =$

For each problem, use your understanding of exponential models and differential equations.

4. A dose of 75 milligrams of a drug is administered to a patient. The amount of the drug, in milligrams, in the person's bloodstream at time t, in hours, is given by $A(t)$. The rate at which the drug leaves the bloodstream can be modeled by the differential equation $\frac{dA}{dt} = -0.09A$. Write an expression for $A(t)$.

5. A population y grows according to the equation $\frac{dy}{dt} = ky$, where k is a constant and t is measured in years. If the population doubles every 4 years, then what is the value of k?

6. A population y grows according to the equation $\frac{dy}{dt} = ky$, where k is a constant and t is measured in years. If the population doubles every 28 years, then what is the value of k?

7. During a certain epidemic, the number of people that are infected at any time increases at a rate proportional to the number of people that are infected at that time. If 5,000 people are infected when the epidemic is first discovered, and 6,000 people are infected 3 days later, how many people are infected 20 days after the epidemic is first discovered?

Answers to 7.8 CA #1

1. $y = -15e^{106t}$	2. $y = 41e^{-0.3t}$	3. $y = -0.5e^{51t}$	4. $y = 75e^{-0.09t}$
5. $k \approx 0.173$	6. $k \approx 0.0247$	7. 16,859 people	