

**AP CALCULUS AB**  
**Supplement 6.8**  
**Differential Equations**

Name \_\_\_\_\_  
Date \_\_\_\_\_  
Period \_\_\_\_\_

1. Find the general solution for each differential equation.

a.  $2y' + x y' = 3y^2$

b.  $\frac{dy}{dx} = \frac{x^2 + 2}{3y^2}$

2. Find the particular solution for each differential equation with given initial condition.

a.  $xy + y + y' = 0$ ;  $y(-2) = 1$

b.  $\frac{dr}{d\theta} = r\theta \sin(\theta^2)$ ;  $r(0) = 1$

3. Radioactive radium has a half-life of approximately 1620 years. What percent of a given amount remains after 100 years?

4. Suppose a bacterial culture triples in population every 5 hours. Given that the initial population is 200 bacteria, determine when the population will reach 20,000 bacteria.

5. A cup of fast-food coffee is 180 °F when freshly poured. After 2 minutes in a room at 70 °F, the coffee will cool to 165 °F.

a. Find the temperature of a cup of fast-food coffee 5 minutes after it has been poured and placed in a room at 70 °F.

b. How long will it take a cup of fast-food coffee to cool to 120 °F if it is placed immediately in a room at 70 °F?

### Supplement 6.8 Answers

$$1a. \quad y = \frac{1}{C - 3\ln|2+x|}$$

$$1b. \quad y = \sqrt[3]{\frac{x^3}{3} + 2x + C}$$

$$2a. \quad y = e^{-x - \frac{x^2}{2}}$$

$$2b. \quad r = e^{\frac{1 - \cos(\theta^2)}{2}}$$

3. 95.811%

4. 20.959032 hrs

5a. 146.246512 °F

5b. 10.756325 min