Gateway Exam #2 Practice Problems
The Derivative as an Instantaneous Rate of Change

1. A ball is thrown into the air. Its height (in meters) at t seconds into its flight is given by $h(t)$. Which of the following must be equal to its instantaneous velocity (in meters per second) at 3 seconds into its flight?

   (a) $h(3)$

   (b) $\frac{h(3)-h(0)}{3}$

   (c) $h'(3)$

   (d) $h'(t)$

   (e) $h'(0) + 3$

2. An oil spill expands over the surface of a lake. Its area (in square meters) at t hours after the initial spill is given by $A(t)$. Which of the following must be equal to the instantaneous rate of change in its area (in square meters per second) at 10 hours after the initial spill?

   (a) $10 * A'(1)$

   (b) $A'(t)$

   (c) $A(10)$

   (d) $\frac{A(10)-A(0)}{10}$

   (e) $A'(10)$

3. A motorcyclist drives due east of Las Vegas. Her velocity (in miles per hour) t hours after she crosses the city limits is given by $v(t)$. Which of the following must be equal to her instantaneous acceleration 5 hours after leaving Las Vegas?

   (a) $\frac{v'(5)}{60}$

   (b) $v'(5)$

   (c) $\frac{v(5)-v(5)}{5}$

   (d) $v(5)$

   (e) $v'(0) + 5$

4. A colony of bacteria grows in a petri dish in a lab. Its population after t hours of growth is given by $P(t)$. Which of the following must be equal to the colony's instantaneous rate of change in population after exactly 1 day of growth?

   (a) $P'(24)$

   (b) $\frac{P(24)-P(0)}{24}$

   (c) $P(24)$

   (d) $P'(1)$

   (e) $P(1)$

5. The cost (in dollars) of producing x dumbbell sets per day at a certain sports company is given by $C(x)$. Which of the following must be equal to the instantaneous rate of change in cost that results from an increase in production level from the current level of 100 dumbbells?

(a) $C(101) - C(100)$

(b) $C(100)$

(c) $C'(100)$

(d) $C'(0) + 100$

(e) $\frac{C(100) - C(0)}{100}$

Answers:

1. c   2. e   3. b   4. a   5. c