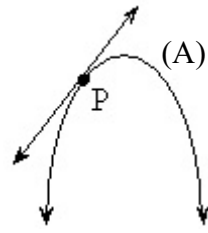


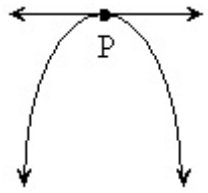
Chapter 2

Rate of Change

1. Which illustrates a positive instantaneous rate of change at P?

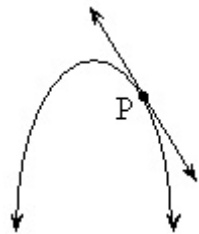


(A)

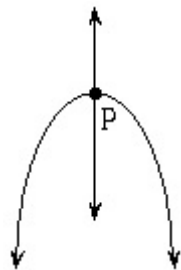


(B)

(C)



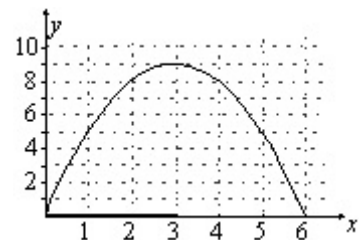
(D)



2. The path of a toy rocket shot into the air is shown by the graph below. What is the approximate instantaneous rate of change at $t = 4$?

(A) -2

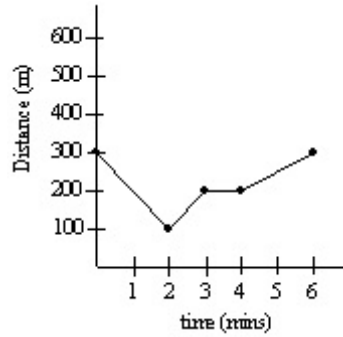
(B) $-\frac{1}{2}$



(C) $\frac{1}{2}$

(D) 2

3. This distance-time graph shows the distance of a tour boat from an iceberg over a six-minute period. What is the average rate of change of distance between the tour boat and the iceberg from 3 to 6 minutes?



(A) $\frac{3}{100}$

(B) 25

(C) $\frac{100}{3}$

(D) 50

4. Suppose this diagram indicates the height of a plant, in centimeters, over several months. What is the average rate of change, in cm per month, of the height of the plant between months 2 and 4?

(A) $\frac{1}{4}$

(B) $\frac{1}{2}$

(C) 4

(D) 8

5. Which line best illustrates a negative instantaneous rate of change at P?

(A)

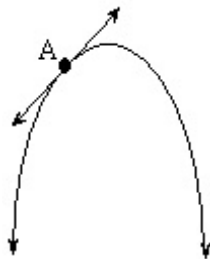
(B)

(C)

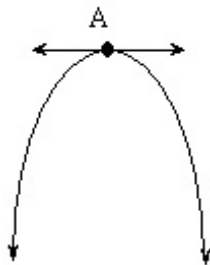
(D)

6. Which illustrates an instantaneous rate of change of zero at A?

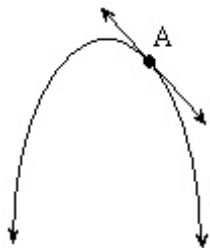
(A)



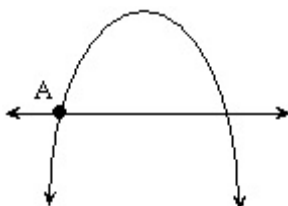
(B)



(C)



(D)



7. Suppose this diagram indicates the profit of a company, in dollars, over several months. What is the average rate of change, in dollars per month, of the company's profit between months 1 and 4?
- (A) -333.33
- (B) -250
- (C) 250
- (D) 333.33
8. At what point would a tangent be drawn to best indicate a negative instantaneous rate of change?
- (A) A
- (B) B
- (C) C
- (D) D
9. The table indicates the number of cases of West Nile virus over a 4 month period. What is the average rate of change, in cases per month, between months 2 and 4?

- (A) -9

month	1	2	3	4
# cases	22	34	30	16

- (B) $-\frac{1}{9}$
- (C) 4
- (D) 9

10. The table indicates the displacement, s , of a particle over time. What is the average rate of change in displacement, in metres per second, between second 1 and second 3?

- (A) -4
- (B) $-\frac{1}{4}$
- (C) $\frac{1}{4}$
- (D) 4

t (seconds)	1	2	3	4
s (metres)	11	6	3	2

11. The Department of Fisheries and Oceans recorded the temperature on the Torrent River over 5 days as illustrated in the table below. Which represents the average rate of change in temperature between days 1 and 5 in $^{\circ}\text{C}$ per day?

- (A) -2
- (B) $-\frac{1}{2}$
- (C) $\frac{1}{2}$
- (D) 2

Day	Temperature in $^{\circ}\text{C}$
1	14
2	15
3	17
4	20
5	22

12. Which best describes instantaneous rate of change?

- (A) slope of an asymptote to a curve
 - (B) slope of a perpendicular to a curve
 - (C) slope of a secant to a curve
 - (D) slope of a tangent to a curve
13. At which point is the instantaneous rate of change greatest?
- (A) A
 - (B) B
 - (C) C
 - (D) D
14. The path of a golf ball after a person hits it is shown in the graph below. What is the average rate of change in the height of the golf ball, in metres per second, from second 3 to second 4?
- (A) -14.3
 - (B) -0.07
 - (C) 0.07
 - (D) 14.3

Answers Rate of Change

1. **A**
2. **A**
3. **C**
4. **C**
5. **B**
6. **B**
7. **A**
8. **A**
9. **A**
10. **A**
11. **D**
12. **D**

13. C

14. A

- The path of a golf ball is described by the function $h(t) = -4.9t^2 + 24.5t + 0.05$ where h is the height of the ball, in metres, and t is time in seconds. Determine the approximate instantaneous rate of change of the height of the ball at 3.2 seconds. Describe what is happening in fact.
- A protein disintegrates into amino acids according to the formula $M = \frac{28}{t+2}$, where M is the mass of the protein in grams and t is time in hours. Calculate the approximate instantaneous rate of change of disintegration at $t = 2$ hours and interpret your answer.
- A diver jumps off a spring board. Her height h , in metres, above the water, t seconds after she jumps, is given by $h(t) = -4.9t^2 + 8t + 5$. Algebraically determine the approximate instantaneous rate of change in her height at 2 seconds.
- The rabbit population in an area is modeled by $P(t) = 200(2)^t$ where $P(t)$ is the population and t is time in years. What is the approximate instantaneous rate of change in the population of rabbits at 3 years?

5. The power P , in watts, supplied to a circuit by a battery is given by the formula $P = 6I - 0.5I^2$, where I is the current in amperes. What is the approximate instantaneous rate of change of power when the current is 4 amperes?
6. The height of a golf ball after being hit is approximated by the equation $h = 18t - 4t^2$, where h is the height above the ground in metres t seconds after the ball is hit. Algebraically determine the approximate instantaneous rate of change of height of the golf ball when the time is 3.0 seconds, and describe what is happening to the ball at that instant.
7. The volume of water at a given time in a 2000 L tank is represented by the formula $V = 2000\left(1 - \frac{t}{45}\right)^2$, where t is time in minutes. Determine the average rate of change in the volume of water in the tank from minute 0 to minute 10, and use it to describe how the volume of water in the tank is changing during that time.
8. The height of a golf ball, h , in metres, t seconds after being struck, is given by the function $h(t) = 28t - 4.9t^2$. What is the instantaneous rate of change in the height of the golf ball at $t = 2$ seconds?

