MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the average rate of change for the function over the given interval.

1) $y = x^2 + 2x$ between $x = 2$ and $x = 6$

    A) 8   B) 12   C) $\dfrac{20}{3}$ D) 10

1) _____

2) $y = \sqrt{2x}$ between $x = 2$ and $x = 8$

    A) 7   B) $-\dfrac{3}{10}$ C) $\dfrac{1}{3}$ D) 2

2) _____

3) $y = 4x^2$ between $x = 0$ to $x = \dfrac{7}{4}$

    A) $-\dfrac{3}{10}$ B) 2   C) $\dfrac{1}{3}$ D) 7

3) _____

4) $y = x^3 + x^2 - 8x - 7$ between $x = 0$ and $x = 2$

    A) $-\dfrac{1}{6}$ B) $\dfrac{1}{2}$ C) –28   D) –2

4) _____

5) $y = \dfrac{3}{x + 2}$ between $x = 1$ and $x = 4$

    A) –2   B) –28   C) $-\dfrac{1}{6}$ D) $\dfrac{1}{2}$

5) _____

Suppose the position of an object moving in a straight line is given by the specified function. Find the instantaneous velocity at time t.

6) $s(t) = t^2 + 3t + 1$, $t = 5$

    A) 41   B) 11   C) 25   D) 13

6) _____

7) $s(t) = 5t^2 - 8t - 1$, $t = 2$

    A) 11   B) 2   C) 3   D) 12

7) _____

8) $s(t) = t^3 + 4t + 6$, $t = 1$

    A) 13   B) 6   C) 7   D) 11

8) _____

**Find the instantaneous rate of change for the function at the given value.**

9) $F(x) = x^2 + 8x$ at $x = 5$

    A) 18   B) 13   C) 10   D) 65

9) _____

10) $s(t) = t^2 + 5t$ at $t = 4$

    A) 13   B) 9   C) 21   D) 3

10) _____

11) $F(x) = 2x^2 + x - 3$ at $x = 4$ 11) _____

     A) 15   B) 17   C) 5   D) 19

12) $s(t) = 3t^2 + 5t - 7$ at $t = -2$ 12) _____

     A) –1   B) 1   C) –17   D) –7

Solve the problem.

13) A particular strain of influenza is known to spread according to the function $p(t) = \frac{1}{2}(t^2 + t)$, where   13) _____

t is the number of days after the first appearance of the strain and p(t) is the percentage of the population that is infected. Find the instantaneous rate of change of p with respect to t at $t = 3$.

     A) 6% per day   B) $\frac{7}{2}$% per day   C) 3% per day   D) 4% per day

14) The graph shows the population in millions of bacteria t minutes after a bactericide is introduced   14) _____
into a culture. Find the average rate of change of population with respect to time for the time from 1 to 4 minutes.

Population (in millions) vs Time (in minutes)
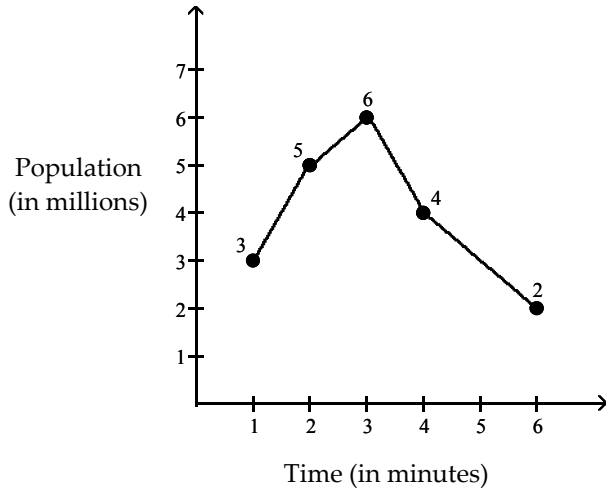
     A) 3   B) $\frac{1}{3}$ C) 4   D) $\frac{1}{4}$

15) The size of a population of mice after t months is $P = 100(1 + 0.2t + 0.02t^2)$. Find the growth rate at $t = 18$ months.   15) _____

     A) 46 mice/month   B) 92 mice/month
     C) 192 mice/month   D) 184 mice/month

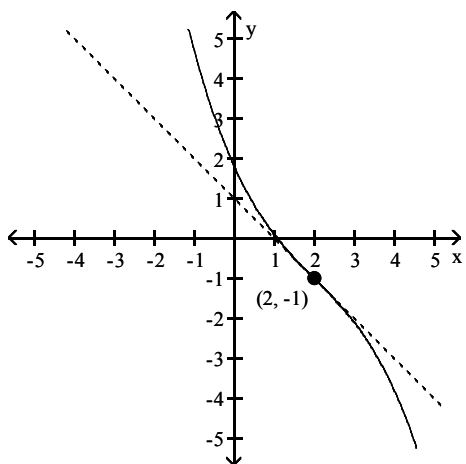**Estimate the slope of the tangent line to the curve at the given point.**

16)

(3, 1)

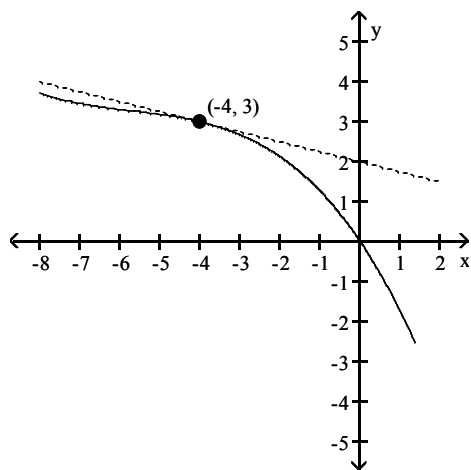A) 2   B) 1   C) $\dfrac{1}{2}$ D) –1

17)

(2, -1)
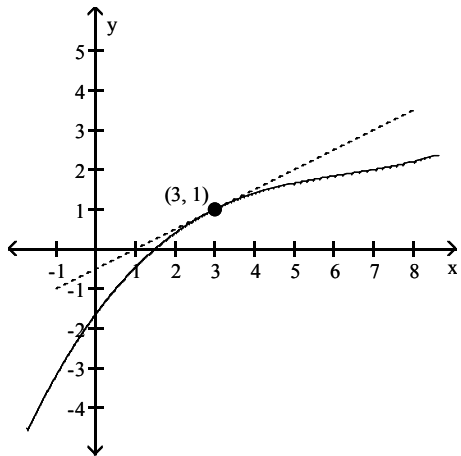
A) $-\dfrac{1}{2}$ B) –1   C) $-\dfrac{3}{2}$ D) 1

18)

A) $-\dfrac{1}{2}$ B) -4 C) $-\dfrac{1}{4}$ D) $\dfrac{1}{4}$

18) _____

Find f'(x) at the given value of x.

19) $f(x) = \sqrt{x}$; Find $f'(81)$.

A) 81 B) $\dfrac{1}{18}$ C) $\dfrac{1}{9}$ D) 9

19) _____

20) $f(x) = \sqrt{x+6}$; Find $f'(10)$.

A) $\dfrac{5\sqrt{5}}{8}$ B) $\dfrac{1}{8}$ C) $\dfrac{\sqrt{5}}{8}$ D) $\dfrac{5}{8}$

20) _____

21) $f(x) = x^2 - 9x - 3$; Find $f'(-1)$.

A) 7 B) -11 C) -2 D) -14

21) _____

22) $f(x) = -6x^2 + 4x + 5$; Find $f'(7)$.

A) -56 B) 88 C) -75 D) -80

22) _____

23) $f(x) = -9x^2 + 6x$; Find $f'(6)$.

A) -102 B) -87 C) -72 D) -108

23) _____

Find the equation of the secant line through the points where x has the given values.

24) $f(x) = x^2 + 2x$; $x = 4, x = 6$

A) $y = 12x$ B) $y = 24x - 12$ C) $y = 12x - 24$ D) $y = 12x + 24$

24) _____

25) $f(x) = \dfrac{3}{x}$; $x = 3, x = 6$

A) $y = \dfrac{1}{6}x - \dfrac{3}{2}$ B) $y = -\dfrac{3}{x^2}$ C) $y = -\dfrac{1}{6}x + \dfrac{3}{2}$ D) $y = -\dfrac{1}{6}x$

25) _____

Find the equation of the tangent line to the curve when x has the given value.

26) $f(x) = -4 - x^2$; $x = 4$

A) $y = 4x + 12$ B) $y = -2x$ C) $y = 8x - 12$ D) $y = -8x + 12$

26) _____

4

27) $f(x) = \dfrac{x^2}{2}$; $x = 5$

27) _____

  A) $y = 5x - 25$ B) $y = 5x - 12.5$ C) $y = 10x - 12.5$ D) $y = 5x + 12.5$

28) $f(x) = \dfrac{x^3}{4}$; $x = -4$

28) _____

  A) $y = 12x + 32$ B) $y = 32x + 4$ C) $y = 32x + 12$ D) $y = 4x + 32$

29) $f(x) = \dfrac{18}{x}$; $x = 3$

29) _____

  A) $y = -2x$ B) $y = -4x + 18$ C) $y = -2x + 12$ D) $y = -2x + 6$

30) $f(x) = x^2 + 3$; $x = -2$

30) _____

  A) $y = -4x - 2$ B) $y = -4x - 5$ C) $y = -2x - 1$ D) $y = -4x - 1$

Find the x-values where the function does not have a derivative.

31)

31) _____
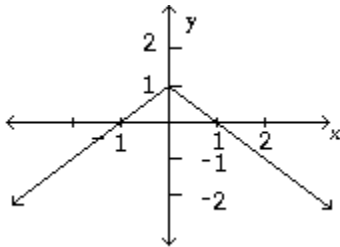
  A) $x = 1$ B) $x = 2$ C) $x = 0$ D) $x = -1$

32)

32) _____
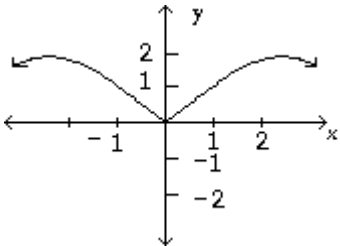
  A) $x = 2$ B) $x = -2, x = 0, x = 2$
  C) $x = -2, x = 2$ D) $x = 0$

33)

33) _____
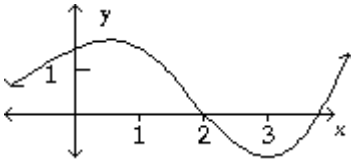
  A) $x = 1, x = 3$ B) $x = 2$
  C) $x = 1, x = 2, x = 3$ D) Exists at all points

5

34)
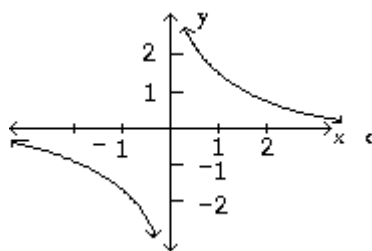
A) $x = -1$, $x = 1$ B) $x = 0$
C) $x = -1$, $x = 0$, $x = 1$ D) Exists at all points

35)
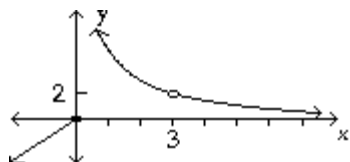
A) $x = 3$ B) $x = 0$
C) $x = 0$, $x = 3$ D) Exists at all points

The graphs of a function f(x) and its derivative f'(x) are shown below. Decide which is the graph of f(x) and which is the graph of f'(x).

36)
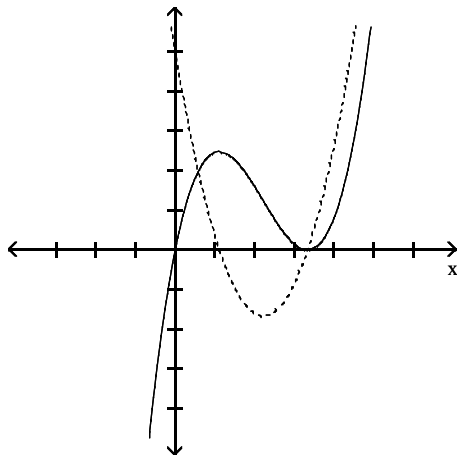
A) Either graph could be the derivative of the other.
B) f(x) is the solid line; f'(x) is the dashed line.
C) Neither graph could be the derivative of the other.
D) f(x) is the dashed line; f'(x) is the solid line.

6

37)
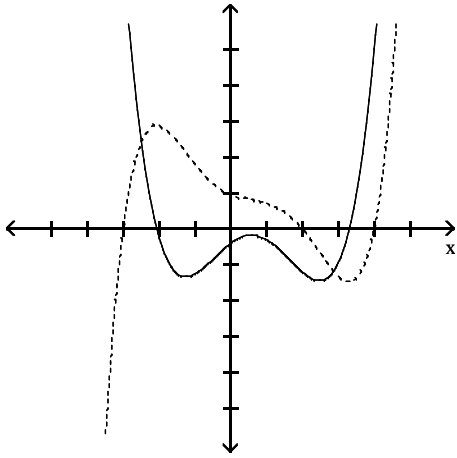
A) Neither graph could be the derivative of the other.
B) f(x) is the solid line; f'(x) is the dashed line.
C) f(x) is the dashed line; f'(x) is the solid line.
D) Either graph could be the derivative of the other.
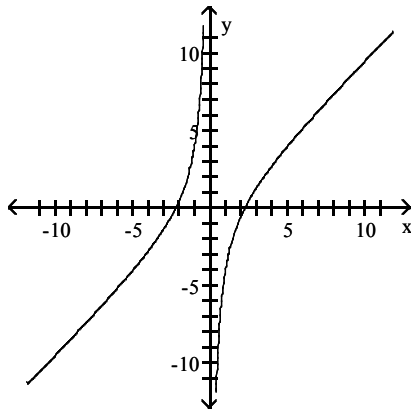
Sketch the derivative of the graph.

38)

38) _____

A)

B)

C)

D)

8

39)

A)

B)

C)

D)
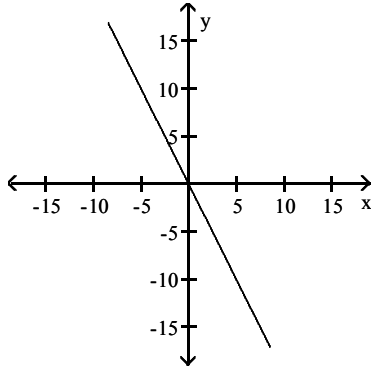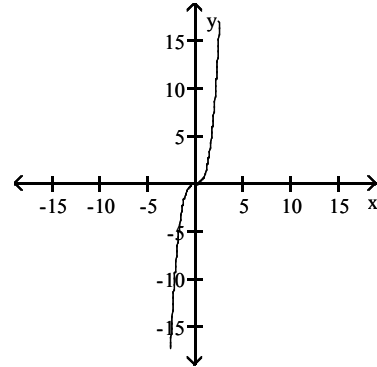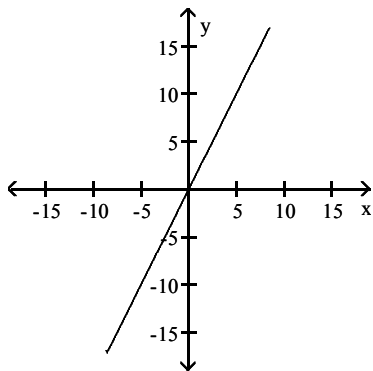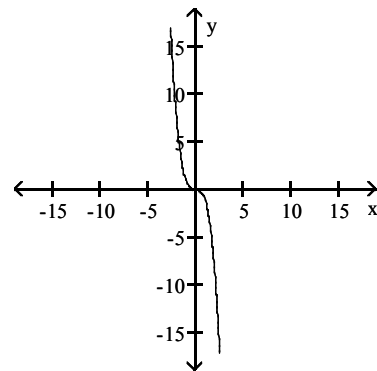

9
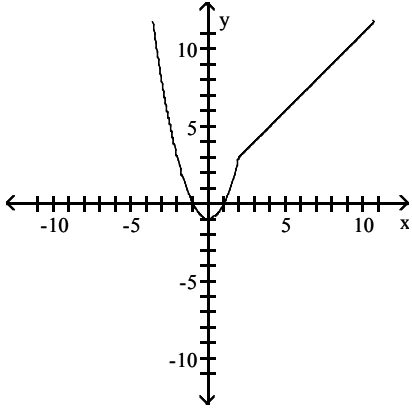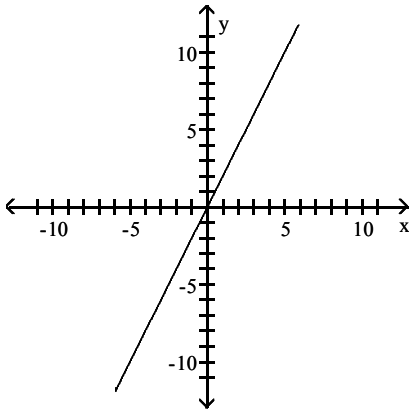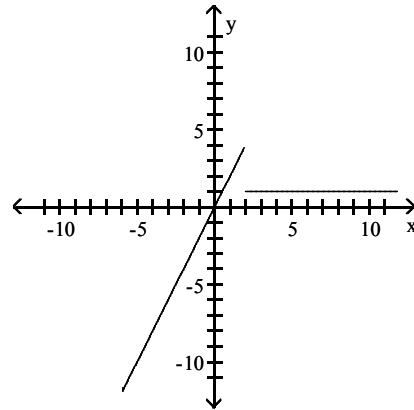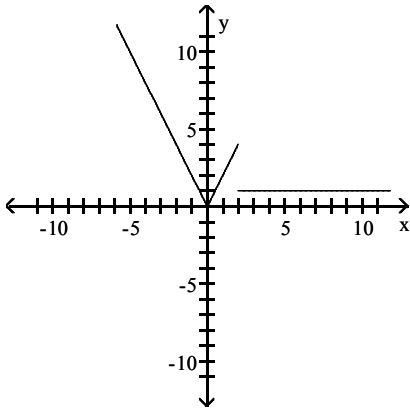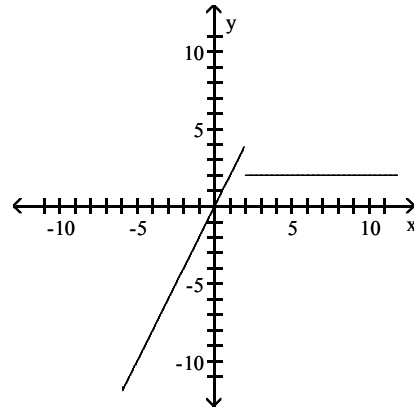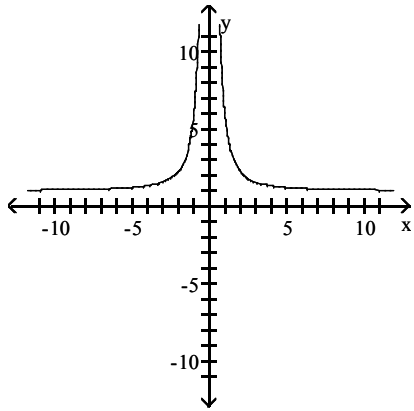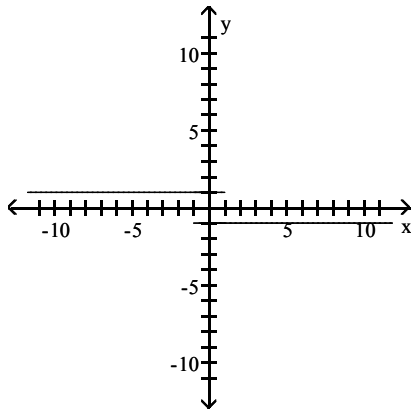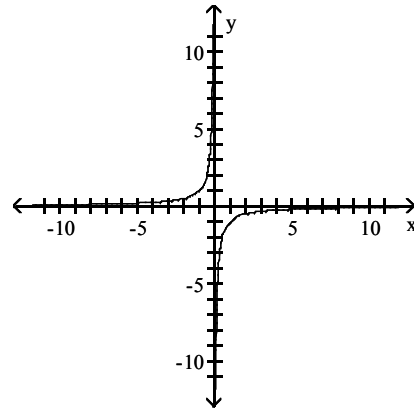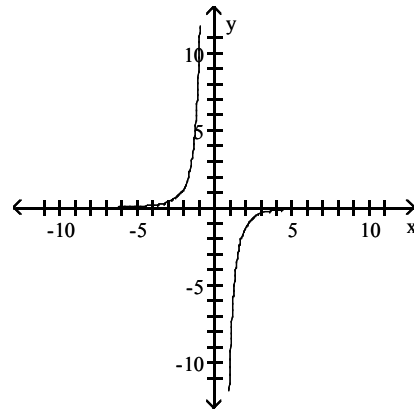
40) _____
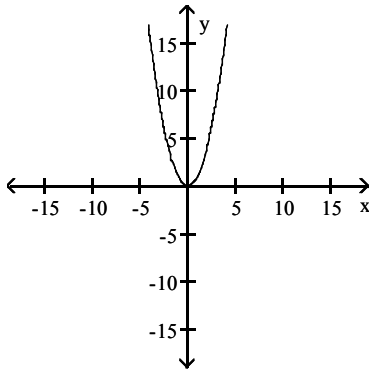
A)

B)

C)

D)

Use the formula $f'(x) = \lim\limits_{z \to x} \dfrac{f(z) - f(x)}{z - x}$ to find the derivative of the function.

41) $f(x) = \dfrac{3}{x + 2}$

A) $-\dfrac{3}{(x + 2)}$ 　　　 B) $-\dfrac{3}{(x + 2)^2}$ 　　　 C) $-\dfrac{3}{x^2}$ 　　　 D) $\dfrac{3}{(x + 2)^2}$

41) _____

42) $f(x) = 2x^2 - 3x + 5$

A) $4x^2 - 3x$ 　　　 B) $4x$ 　　　 C) $2x - 3$ 　　　 D) $4x - 3$

42) _____

10

43) $g(x) = \dfrac{x}{x + 4}$

43) _____

    A) $-\dfrac{4}{(x + 4)^2}$ B) $\dfrac{4}{(x + 4)^2}$ C) $\dfrac{x}{(x + 4)^2}$ D) $\dfrac{x^2}{x + 4}$

44) $g(x) = 3x + \sqrt{x}$

44) _____

    A) $\dfrac{1}{2\sqrt{x}}$ B) $3 + \dfrac{1}{\sqrt{x}}$ C) $3 + \dfrac{1}{2\sqrt{x}}$ D) $3 - \dfrac{1}{2\sqrt{x}}$

1) D
2) C
3) D
4) D
5) C
6) D
7) D
8) C
9) A
10) A
11) B
12) D
13) B
14) B
15) B
16) C
17) B
18) C
19) B
20) B
21) B
22) D
23) A
24) C
25) C
26) D
27) B
28) A
29) C
30) D
31) C
32) D
33) D
34) B
35) C
36) B
37) C
38) B
39) A
40) C
41) B
42) D
43) B
44) C