**1.** What is $\lim_{h\to 0} \dfrac{(x+h)^2 - x^2}{h}$ ?

**A.** $2xh$

**B.** $2x$

**C.** $h$

**D.** $0$

**2.** If $f(x) = \sqrt{x+2}$, then which one of the following is equal to $f'(x)$ ?

**A.** $\lim_{h\to 0} \dfrac{\sqrt{x+h+2} - \sqrt{x+2}}{2}$

**B.** $\lim_{h\to 0} \dfrac{\sqrt{x+h+2} - \sqrt{x+2}}{h}$

**C.** $\lim_{x\to 2} \dfrac{\sqrt{x+2} - \sqrt{h+2}}{h}$

**D.** $\lim_{x\to 2} \dfrac{\sqrt{x+h+2} - \sqrt{h}}{h}$

**3.** If $f(x) = x^{\frac{2}{5}}$, then which one of the following is equal to $f'(a)$ ?

**A.** $\lim_{h\to 0} \dfrac{(a+h)^{2/5} - a^{2/5}}{h}$

**B.** $\lim_{h\to 0} \dfrac{(\frac{1}{x})^{\frac{5}{2}} - (\frac{1}{a})^{\frac{5}{2}}}{h}$

**C.** $\lim_{h\to 0} \dfrac{(x+h)^{2/5} - h^{2/5}}{h}$

**D.** $\lim_{x\to a} x^{2/5}$

**4.** The functions $f$ and $g$ are differentiable and have the values shown in the table.

If $A = f + g$ then $A'(2) =$

| $x$ | $f$ | $f'$ | $g$ | $g'$ |
|---|---|---|---|---|
| 0 | 5 | 1 | $-7$ | $\frac{1}{4}$ |
| 2 | 8 | 3 | $-5$ | 1 |
| 4 | 14 | 9 | $-3$ | 4 |
| 6 | 26 | 27 | $-1$ | 16 |

**A.** 3

**B.** 4

**C.** $-4$

**D.** 5

**5.** The functions $f$ and $g$ have the values shown in the table and are differentiable.

If $A = f \cdot g$ then $A'(0) =$

| $x$ | $f$ | $f'$ | $g$ | $g'$ |
|---|---|---|---|---|
| 0 | 6 | 1 | −8 | $\frac{1}{3}$ |
| 2 | 8 | 3 | −5 | 1 |
| 4 | 14 | 9 | −3 | 4 |
| 6 | 26 | 27 | −1 | 16 |

**A.** 0

**B.** −6

**C.** $\frac{10}{3}$

**D.** $\frac{1}{3}$

**6.** The functions $f$ and $g$ are differentiable and have the values shown in the table.

If $A = \left(\frac{1}{f}\right)$ then $A'(4) =$

| $x$ | $f$ | $f'$ | $g$ | $g'$ |
|---|---|---|---|---|
| 0 | 5 | 1 | −7 | $\frac{1}{4}$ |
| 2 | 8 | 3 | −5 | 1 |
| 4 | 14 | 9 | −3 | 4 |
| 6 | 26 | 27 | −1 | 16 |

**A.** 0

**B.** $\frac{9}{146}$

**C.** $-\frac{9}{196}$

**D.** $-\frac{1}{9}$

**7.** The functions $f$ and $g$ have the values shown in the table and are differentiable.

If $A = \left(\frac{g}{f}\right)$ then $A'(2) =$

| $x$ | $f$ | $f'$ | $g$ | $g'$ |
|---|---|---|---|---|
| 0 | 5 | 1 | −7 | $\frac{1}{4}$ |
| 2 | 8 | 3 | −5 | 1 |
| 4 | 14 | 9 | −3 | 4 |
| 6 | 26 | 27 | −1 | 16 |

**A.** 23

**B.** $-\frac{23}{64}$

**C.** $\frac{23}{64}$

**D.** −23

**8.** The functions $f$ and $g$ are differentiable and have the values shown in the table.

If $A = f(g(x))$ then $A'(-8) =$

| $x$ | $f$ | $f'$ | $g$ | $g'$ |
|---|---|---|---|---|
| −8 | 4 | 3 | −2 | 6 |
| −6 | 10 | 12 | 0 | 9 |
| −2 | 20 | 9 | 6 | 18 |
| 2 | 30 | 15 | 12 | 24 |

**A.** 18

**B.** 54

**C.** 9

**D.** −9

**9.** $f$ and $g$ are differentiable functions and have the values shown in the table.

If $A = \sqrt{g(x)}$ then $A'(-2) =$

| $x$ | $f$ | $f'$ | $g$ | $g'$ |
|---|---|---|---|---|
| $-8$ | 4 | 3 | $-2$ | 6 |
| $-6$ | 10 | 12 | 0 | 9 |
| $-2$ | 16 | 9 | 36 | 18 |
| 2 | 30 | 15 | 52 | 24 |

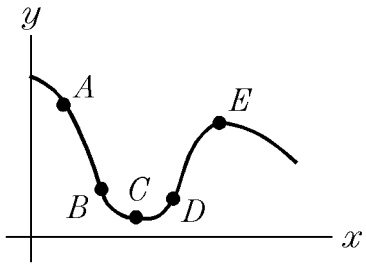
**A.** $\frac{9}{8}$

**B.** $\frac{3}{2}$

**C.** $\frac{4}{9}$

**D.** 6

**10.** At which of the five points shown on the graph is $\frac{dy}{dx}$ positive? Choose the *best* answer.



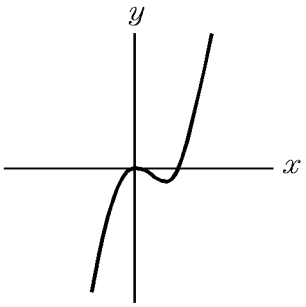

**A.** A and E

**B.** D only

**C.** C, D, and E

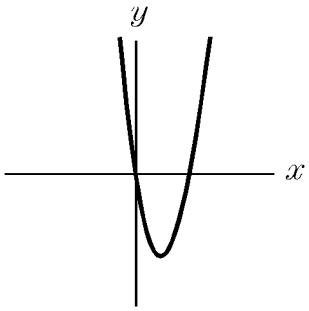
**D.** E only

**11.**

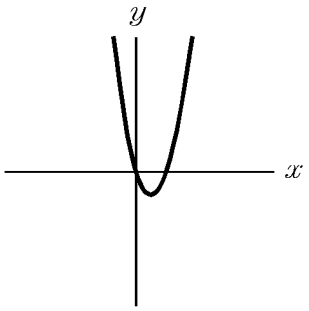



Given the graph of $f$ shown above, which of the following is the graph of the derivative, $f'$?

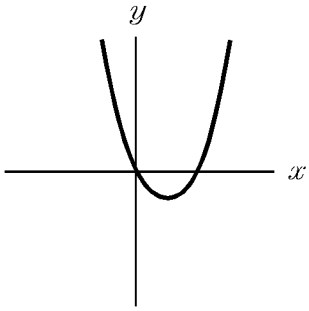
**A.**



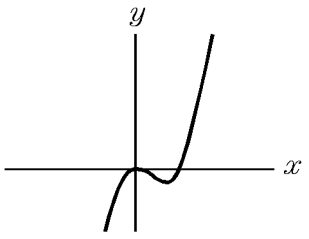

**B.**




**C.**

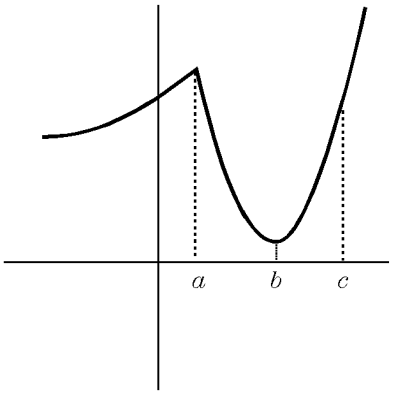



**D.**




**12.** *REMOVED*

**13.**




Which of the following tables best goes with the graph of $f$ shown?

**A.**

| $x$ | $f'(x)$ |
|---|---|
| $a$ | 0 |
| $b$ | 0 |
| $c$ | 4 |

**B.**

| $x$ | $f'(x)$ |
|---|---|
| $a$ | 0 |
| $b$ | 0 |
| $c$ | $-2$ |

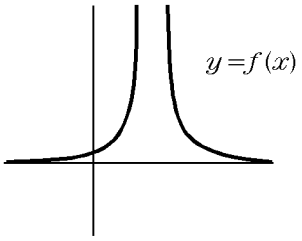
**C.**

| $x$ | $f'(x)$ |
|---|---|
| $a$ | does not exist |
| $b$ | 0 |
| $c$ | 6.2 |

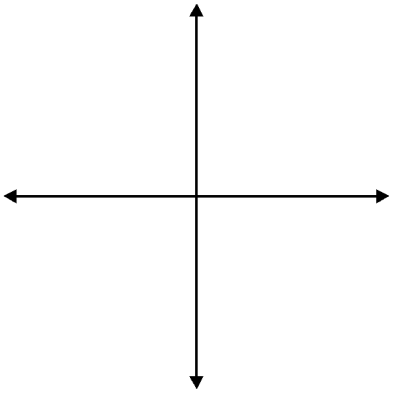
**D.**

| $x$ | $f'(x)$ |
|---|---|
| $a$ | does not exist |
| $b$ | does not exist |
| $c$ | $-1$ |

**14.**




Given the graph of $f'(x)$, sketch the graph of $f(x)$



**15.** If $f(x) = 5x^3$, then $f'(2) =$

**A.** 30

**B.** 10

**C.** 40

**D.** 60

*Calculator active*

**16.** A curve is given by $y = a^3$, where $a = m^2(2m - 1)$. Approximate the slope of the curve when $m = 0.6543$.

**A.** 0.108

**B.** 0.143

**C.** 0.066

**D.** 0.047

**17.** Find the derivative, $\frac{dy}{dx}$, of $y = \frac{2x}{1 - 3x^2}$.

**A.** $-\frac{1}{3x}$

**B.** $\frac{6x^2 + 2}{(1 - 3x^2)^2}$

**C.** $\frac{9x^2 - 2}{(1 - 3x)^2}$

**D.** $\frac{2x}{3(1 - 3x^2)^2}$

*Calculator active*

**18.** Given the function $f(c) = \frac{2c^2}{(c^3 + 4)^2}$, find $f'(3.526)$ to three decimal places.

**A.** $-0.011$

**B.** $-0.019$

**C.** 0.018

**D.** 0.020

**19.** Find the derivative, $\frac{dy}{dx}$, of $y = \frac{x^2 - 1}{x^2 + 1}$.

**A.** $\frac{4x}{(x^2 + 1)^2}$

**B.** 1

**C.** $-\frac{4x}{(x^2 + 1)^2}$

**D.** $\frac{-4x^2 - 4x}{(x^2 + 1)^2}$

**20.** If $y = \dfrac{-5}{\sqrt[3]{x+3}}$, then $\dfrac{dy}{dx} =$

**A.** $\dfrac{5}{3\sqrt[3]{(x+3)^4}}$

**B.** $\dfrac{8}{\sqrt{(x+3)^5}}$

**C.** $\dfrac{-1}{\sqrt{(x+3)^4}}$

**D.** $\dfrac{-1}{5(x+3)^{4/3}}$

**21.** If $f(x) = (2x^3 + 5x^2 - 7x + 4)(4x^2 - 5x + 2)$, then find $f'(1)$.

**A.** 21

**B.** 27

**C.** $-27$

**D.** 3

**22.** Given $f(2) = 3, f'(2) = 4, g(2) = -2$, and $g'(2) = -4$. Find $h'(2)$ if $h(x) = f(x) \times g(x)$.

**A.** $-16$

**B.** 16

**C.** $-20$

**D.** 0

**23.** Given $f(5) = 4, f'(5) = 2, g(5) = 6$, and $g'(5) = -7$. Find $h'(5)$ if $h(x) = f(x) \times g(x)$.

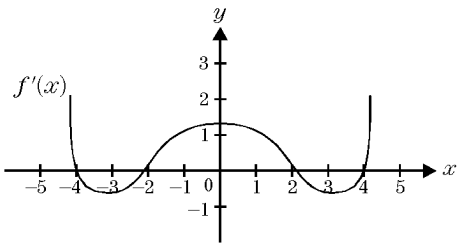
**A.** $-16$

**B.** 40

**C.** $-50$

**D.** 14

**24.** The graph $f(x)$ has horizontal tangents when $x =$




**A.** $-4, 2$

**B.** $-4, -2, 2, 4$

**C.** $-4, -2, 4$

**D.** $2, 4$

**25.** Find an equation for the tangent line to the graph of $f(x) = \sqrt{x+1}$ at the point where $x = 3$.

**A.** $x - 4y = -5$

**B.** $x + 4y = 8$

**C.** $x - 4y = 5$

**D.** $4x - y = -8$

**26.** If $f(x) = x^2 - 10$, find an equation of the tangent to the curve passing through the point $(5, 1)$.

**A.** $y - 1 = -10(x - 5)$

**B.** $y + 5 = -10(x + 1)$

**C.** $y - 1 = 10(x - 5)$

**D.** $y - 5 = 10(x - 1)$

**27.** The graph of $f(x) = \dfrac{3x^2}{16 - x^2}$ has a horizontal tangent at $y =$

**A.** $-4$

**B.** $-3$

**C.** $3$

**D.** $0$

**28.** If $f(x) = (x-5)^{2/3} + 1$, then the $x$-value of a vertical tangent is

**A.** 0

**B.** 1

**C.** 5

**D.** $\sqrt[3]{5}$

**29.** Find the equation of the tangent line to the graph of $x^2 - 3y^2 = 1$ at the point $(2, 1)$.

**A.** $y - 1 = \frac{2}{3}(x + 2)$

**B.** $y + 1 = \frac{2}{3}(x + 2)$

**C.** $y - 1 = \frac{2}{3}(x - 2)$

**D.** $y = -\frac{3}{2}(x - 2)$

**30.** $\frac{d^6(x^6)}{dx^6} =$

**A.** $6x^5$

**B.** $120x$

**C.** 720

**D.** $360x^3 + 120x^2 + x$

**31.** Find $D_x^2 y$ for $y = \frac{1-x}{x-3}$.

**A.** 0

**B.** $\frac{-8}{(x-3)^3}$

**C.** $\frac{-4}{(x-2)^3}$

**D.** $\frac{-4}{(x-3)^3}$

**32.** Given $y^3 = x^3 - 1$, find $y''$.

**A.** $2xy^{-2}(1 - x^3y^{-3})$

**B.** $2xy^2\left(1 - \dfrac{x^3}{y^3}\right)$

**C.** $\dfrac{2x^2 - 2x^2y}{y^4}$

**D.** $\dfrac{2xy^2 - x^2y}{y^4}$

**33.** Given $x^2 - 5xy + y = 8$, find $y''$.

**34.** Find $f'(x)$ for $f(x) = (2x^2 + 5)^7$.

**A.** $7(4x)^6$

**B.** $(4x)^7$

**C.** $28x(2x^2 + 5)^6$

**D.** $28x^7$

**35.** Find $\dfrac{dy}{dx}$ for $y = x^3\sqrt{x+1}$.

**A.** $\dfrac{3x^2}{2\sqrt{x+1}}$

**B.** $\dfrac{x^2(7x+6)}{2\sqrt{x+1}}$

**C.** $\dfrac{7x^3 + x^2}{2\sqrt{x+1}}$

**D.** $\dfrac{x^2\sqrt{x+1}}{\sqrt{x^6+1}}$

**36.** If $y = \dfrac{(4x-3)^2}{\sqrt{x}}$, then $\dfrac{dy}{dx} =$

**A.** $\dfrac{3(4x-1)(4x+3)}{2x^{3/2}}$

**B.** $\dfrac{9(4x-3)}{2x^{1/2}}$

**C.** $\dfrac{3(4x-3)(4x+1)}{2x^{3/2}}$

**D.** $3(4x-3)x^{-3/2}$

**37.** Find $\frac{dy}{dx}$ at $x = -1$ given $y = u^3 - \frac{2}{u^3}$ and $u = \sqrt{3x+4}$.

**A.** $\frac{2}{27}$

**B.** 12

**C.** $\frac{27}{2}$

**D.** 27

**38.** If $y = \frac{u^2+1}{u}$ and $u = \sqrt{t+1}$, find $y'$ when $t = 3$.

**A.** $\frac{3}{16}$

**B.** $\frac{3}{4}$

**C.** 4

**D.** $\frac{7}{9}$

**39.** If $x = y + 3y^2 + 4y^3$, then $y' =$

**A.** $\frac{1}{1+6y+12y^2}$

**B.** $\frac{5}{6y+1+12y^2}$

**C.** $\frac{4}{3(1+6y+8y^2)}$

**D.** $1 + 6y + 12y^2$

**40.** Find $\frac{dy}{dx}$ given $x^2 + y^2 = 2xy$.

**A.** $\frac{y+x}{y-x}$

**B.** 1

**C.** $-\frac{x}{y}$

**D.** $\frac{1}{2x-2y}$

**41.** If $y = \dfrac{x}{x+y}$, then $\dfrac{dy}{dx} =$

**A.** $\dfrac{y}{(x+y)^2 + x}$

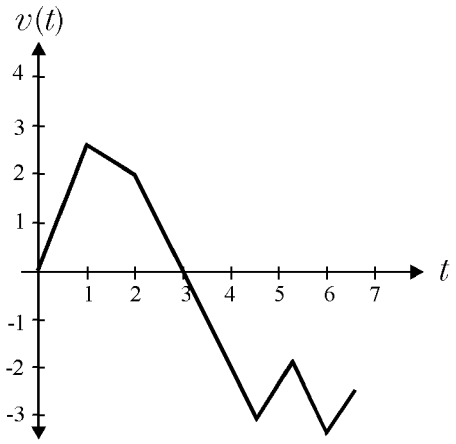
**B.** $\dfrac{1-y}{x+2y}$

**C.** $\dfrac{-1+\sqrt{5}x}{2}$

**D.** $\dfrac{1}{1+y}$

**42.** A mouse is running through a straight pipe. The velocity, $v(t)$, of the mouse is given at time $t$ for $0 \le t \le 7$.

According to the graph, at what time $t$ is the mouse's speed the greatest?




**A.** 1

**B.** 3

**C.** 5

**D.** 6

**43.** A ground hog starts at time $t = 0$ and moves along a straight path that can be described by using the $x$-axis so that its position at any time $t \geq 0$ is $x(t) = t^3 - 6t^2 + 9t + 12$. What is the velocity of the ground hog at $t = 0$?

**A.** $-9$

**B.** $0$

**C.** $6$

**D.** $9$

1.
Answer: B
CodePath: EAS.APC.D.A.1

2.
Answer: B
CodePath: EAS.APC.D.A.3

3.
Answer: A
CodePath: EAS.APC.D.A.8

4.
Answer: B
CodePath: EAS.APC.D.B.1

5.
Answer: B
CodePath: EAS.APC.D.B.11

6.
Answer: C
CodePath: EAS.APC.D.B.14

7.
Answer: C
CodePath: EAS.APC.D.B.20

8.
Answer: B
CodePath: EAS.APC.D.B.21

9.
Answer: B
CodePath: EAS.APC.D.B.24

10.
Answer: B
CodePath: EAS.APC.D.D.3

11.
Answer: B
CodePath: EAS.APC.D.D.8

12.
Answer: A
CodePath: EAS.APC.D.D.11

13.
Answer: C
CodePath: EAS.APC.D.D.17

14.
Answer:
CodePath: EAS.APC.D.D.29

15.
Answer: D
CodePath: EAS.APC.E.B.1

16.
Answer: C
CodePath: EAS.APC.E.B.4

17.
Answer: B
CodePath: EAS.APC.E.B.23

18.
Answer: A
CodePath: EAS.APC.E.B.25

19.
Answer: A
CodePath: EAS.APC.E.B.27

20.
Answer: A
CodePath: EAS.APC.E.B.30

21.
Answer: A
CodePath: EAS.APC.E.B.39

22.
Answer: C
CodePath: EAS.APC.E.B.63

23.
Answer: A
CodePath: EAS.APC.E.B.64

24.
Answer: B
CodePath: EAS.APC.E.C.1

25.
Answer: A
CodePath: EAS.APC.E.C.3

26.
Answer: C
CodePath: EAS.APC.E.C.6

27.
Answer: D
CodePath: EAS.APC.E.C.19

28.
Answer: C
CodePath: EAS.APC.E.C.28

29.
Answer: C
CodePath: EAS.APC.E.C.60

30.
Answer: C
CodePath: EAS.APC.E.D.1

31.
Answer: D
CodePath: EAS.APC.E.D.7

32.
Answer: A
CodePath: EAS.APC.E.D.15

33.
Answer: $\frac{-398}{(5x-1)^3}$
CodePath: EAS.APC.E.D.36

34.
Answer: C
CodePath: EAS.APC.E.F.3

35.
Answer: B
CodePath: EAS.APC.E.F.9

36.
Answer: C
CodePath: EAS.APC.E.F.17

37.
Answer: C
CodePath: EAS.APC.E.F.55

38.
Answer: A
CodePath: EAS.APC.E.F.57

39.
Answer: A
CodePath: EAS.APC.E.G.1

40.
Answer: B
CodePath: EAS.APC.E.G.5

41.
Answer: B
CodePath: EAS.APC.E.G.14

42.
Answer: D
CodePath: EAS.APC.E.I.14

43.
Answer: D
CodePath: EAS.APC.E.I.17