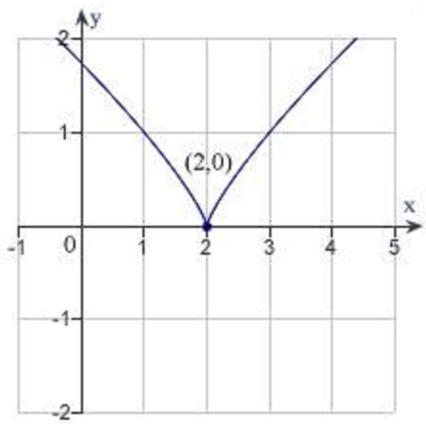
Name: ________________________ Class: ___________________ Date: __________ ID: A

Chapter 3 Practice

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. Find the value of the derivative (if it exists) of $f(x) = (x-2)^{4/5}$ at the indicated extremum.



a. $f'(2)$ is undefined.
b. $f'(2) = (-4)^{4/5}$
c. $f'(2) = 0$
d. $f'(2) = \frac{4}{5}(2)^{-1/5}$
e. $f'(2) = (4)^{4/5}$

____ 2. Find all critical numbers of the function $f(x) = \sin^2 6x + \cos 6x$, $0 < x < \frac{\pi}{3}$.

a. $\frac{\pi}{18}, \frac{\pi}{12}, \frac{\pi}{9}, \frac{\pi}{4}$
b. $\frac{\pi}{18}, \frac{\pi}{6}, \frac{5\pi}{18}$
c. $\frac{\pi}{36}, \frac{\pi}{6}, \frac{2\pi}{9}$
d. $\frac{\pi}{24}, \frac{\pi}{6}, \frac{\pi}{2}$
e. $\frac{\pi}{6}, \frac{5\pi}{24}, \frac{7\pi}{24}$

____ 3. Locate the absolute extrema of the function $g(x) = \frac{4x+5}{5}$ on the closed interval $[0, 5]$.

a. absolute maximum: $(5, 5)$
absolute minimum: $(0, 0)$
b. absolute maximum: $(5, 1)$
absolute minimum: (0, 5)
c. absolute maximum: $(5, 5)$
absolute minimum: $(0, 1)$
d. absolute maximum: $(5, 5)$
absolute minimum: $(1, 0)$
e. absolute maximum: $(0, 5)$
absolute minimum: $(1, 0)$

____ 4. Locate the absolute extrema of the function $f(x) = x^3 - 12x$ on the closed interval $[0, 4]$.

a. absolute max: $(2, -16)$; absolute min: $(4, 16)$
b. no absolute max; absolute min: $(4, 16)$
c. absolute max: $(4, 16)$; absolute min: $(2, -16)$
d. absolute max: $(4, 16)$; no absolute min
e. no absolute max or min

____ 5. Locate the absolute extrema of the given function on the closed interval [–60, 60].

$$f(x) = \frac{60x}{x^2 + 36}$$

a. absolute max: (0, 0); absolute min $(-6, -5)$
b. absolute max: $(6, 5)$; absolute min (0, 0)
c. absolute max: $(6, 5)$; absolute min $(-6, -5)$
d. absolute max: $(6, 5)$; no absolute min
e. no absolute max; absolute min: $(-6, -5)$

____ 6. Locate the absolute extrema of the function $f(x) = \sin \pi x$ on the closed interval $\left[0, \frac{1}{3}\right]$.

a. The absolute minimum is 0, and it occurs at the left endpoint $x = 0$.
The absolute maximum is $\frac{\sqrt{3}}{2}$, and it occurs at the right endpoint $x = \frac{1}{3}$.

b. The absolute minimum is 0, and it occurs at the right endpoint $x = \frac{1}{3}$.
The absolute maximum is $\frac{1}{2}$, and it occurs at the left endpoint $x = 0$.

c. The absolute minimum is 0, and it occurs at the left endpoint $x = 0$.
The absolute maximum is $\frac{1}{2}$, and it occurs at the right endpoint $x = \frac{1}{3}$.

d. The absolute minimum is 0, and it occurs at the right endpoint $x = \frac{1}{3}$.
The absolute maximum is $\frac{\sqrt{2}}{2}$ and it occurs at the left endpoint $x = 0$.

e. The absolute minimum is 0, and it occurs at the left endpoint $x = 0$.
The absolute maximum is $\frac{\sqrt{2}}{2}$, and it occurs at the right endpoint $x = \frac{1}{3}$.

____ 7. Use a graphing utility to graph the function $f(x) = \sqrt{x} + \cos\frac{x}{2}$ and locate the absolute extrema of the function on the interval $[0, 2\pi]$.

a. left endpoint: $(0, 1.000)$ absolute minimum
right endpoint: $(2\pi, 1.507)$ absolute maximum
critical points: none

b. left endpoint: $(0, 0.000)$ absolute minimum
right endpoint: $(2\pi, 2.507)$ absolute maximum
critical points: none

c. left endpoint: $(0, 1.000)$ absolute minimum
right endpoint: $(2\pi, 1.507)$
critical points: $(1.729, 1.964)$ absolute maximum

d. left endpoint: $(0, 2.507)$ absolute maximum
right endpoint: $(2\pi, 0.000)$ absolute minimum
critical points: none

e. left endpoint: $(0, 1.000)$ absolute minimum
right endpoint: $(2\pi, 1.964)$ absolute maximum
critical points: $(1.729, 1.507)$

____ 8. Determine whether Rolle's Theorem can be applied to $f(x) = -x^2 + 10x$ on the closed interval $\left[0,10\right]$. If Rolle's Theorem can be applied, find all values of c in the open interval $\left(0,\ 10\right)$ such that $f\,'(c) = 0$.

a. Rolle's Theorem applies; $c = 6$, $c = 5$
b. Rolle's Theorem applies; $c = 4$, $c = 6$
c. Rolle's Theorem applies; $c = 5$
d. Rolle's Theorem applies; $c = 4$
e. Rolle's Theorem does not apply

____ 9. Determine whether Rolle's Theorem can be applied to the function $f(x) = (x+3)(x+2)^2$ on the closed interval $\left[-3,-2\right]$. If Rolle's Theorem can be applied, find all numbers c in the open interval $\left(-3,-2\right)$ such that $f\,'(c) = 0$.

a. Rolle's Theorem applies; $-\frac{8}{3}$
b. Rolle's Theorem applies; $-\frac{8}{5}$
c. Rolle's Theorem applies; $-\frac{4}{5}$
d. Rolle's Theorem applies; $-\frac{4}{3}$
e. Rolle's Theorem does not apply

____ 10. Determine whether Rolle's Theorem can be applied to $f(x) = \dfrac{x^2 - 13}{x}$ on the closed interval $\left[-13,13\right]$. If Rolle's Theorem can be applied, find all values of c in the open interval $\left(-13,13\right)$ such that $f\,'(c) = 0$.

a. $c = 8$
b. $c = 12$, $c = 11$
c. $c = 11$, $c = 8$
d. $c = 12$
e. Rolle's Theorem does not apply

____ 11. Determine whether the Mean Value Theorem can be applied to the function $f(x) = x^2$ on the closed interval [3,9]. If the Mean Value Theorem can be applied, find all numbers c in the open interval (3,9) such that $f\,'(c) = \dfrac{f(9) - f(3)}{9 - (3)}$.

a. MVT applies; $c = 6$
b. MVT applies; $c = 7$
c. MVT applies; $c = 4$
d. MVT applies; c = 5
e. MVT applies; $c = 8$

____ 12. Determine whether the Mean Value Theorem can be applied to the function $f(x) = x^3$ on the closed interval [0,16]. If the Mean Value Theorem can be applied, find all numbers c in the open interval (0,16) such that $f'(c) = \dfrac{f(16) - f(0)}{16 - 0}$.

a. MVT applies; $-\dfrac{16\sqrt{3}}{3}$
b. MVT applies; 4
c. MVT applies; $\dfrac{16\sqrt{3}}{3}$
d. MVT applies; 8
e. MVT does not apply

____ 13. The height of an object t seconds after it is dropped from a height of 550 meters is $s(t) = -4.9t^2 + 550$. Find the average velocity of the object during the first 7 seconds.

a. 34.30 m/sec
b. –34.30 m/sec
c. –49.00 m/sec
d. 49 m/sec
e. –16.00 m/sec

____ 14. A plane begins its takeoff at 2:00 P.M. on a 2200-mile flight. After 12.5 hours, the plane arrives at its destination. Explain why there are at least two times during the flight when the speed of the plane is 100 miles per hour.

a. By the Mean Value Theorem, there is a time when the speed of the plane must equal the average speed of 303 mi/hr. The speed was 100 mi/hr when the plane was accelerating to 303 mi/hr and decelerating from 303 mi/hr.

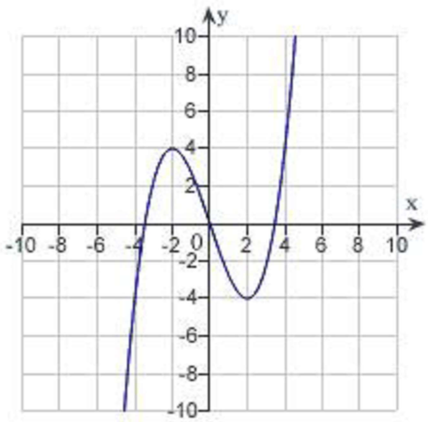
b. By the Mean Value Theorem, there is a time when the speed of the plane must equal the average speed of 152 mi/hr. The speed was 100 mi/hr when the plane was accelerating to 152 mi/hr and decelerating from 152 mi/hr.

c. By the Mean Value Theorem, there is a time when the speed of the plane must equal the average speed of 88 mi/hr. The speed was 100 mi/hr when the plane was accelerating to 88 mi/hr and decelerating from 88 mi/hr.

d. By the Mean Value Theorem, there is a time when the speed of the plane must equal the average speed of 117 mi/hr. The speed was 100 mi/hr when the plane was accelerating to 117 mi/hr and decelerating from 117 mi/hr.

e. By the Mean Value Theorem, there is a time when the speed of the plane must equal the average speed of 176 mi/hr. The speed was 100 mi/hr when the plane was accelerating to 176 mi/hr and decelerating from 176 mi/hr.

____ 15. Use the graph of the function $y = \frac{x^3}{4} - 3x$ given below to estimate the open intervals on which the function is increasing or decreasing.



a. increasing on $(-\infty,-2)$ and $(2,\infty)$; decreasing on $(2,2)$
b. increasing on $(-\infty,-2)$ and $(2,\infty)$; decreasing on $(-2,2)$
c. increasing on $(-2,2)$; decreasing on $(-\infty,-2)$ and $(2,\infty)$
d. increasing on$(-2,-2)$ and $(2,\infty)$; decreasing on $(-2,-2)$
e. increasing on $(-\infty,2)$ and $(2,\infty)$; decreasing on $(-2,\infty)$

____ 16. Identify the open intervals where the function $f(x) = x\sqrt{30-x^2}$ is increasing or decreasing.

a. decreasing: $\left(-\infty,\sqrt{15}\right)$; increasing: $\left(\sqrt{15},\infty\right)$
b. decreasing on $(-\infty,\infty)$
c. increasing: $\left(-\infty,\sqrt{30}\right)$; decreasing: $\left(\sqrt{30},\infty\right)$
d. increasing: $\left(-\sqrt{15},\sqrt{15}\right)$; decreasing: $\left(-\sqrt{30},-\sqrt{15}\right)\cup\left(\sqrt{15},\sqrt{30}\right)$
e. increasing: $\left(-\sqrt{30},\sqrt{15}\right)\cup\left(\sqrt{15},\sqrt{30}\right)$; decreasing: $\left(-\sqrt{15},\sqrt{15}\right)$

____ 17. Find the critical number of the function $f(x) = -6x^2 + 108x + 7$.

a. $x = 18$
b. $x = 9$
c. $x = 84$
d. $x = 14$
e. $x = 7$

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____ 18. Find the relative extremum of $f(x) = -9x^2 + 54x + 2$ by applying the First Derivative Test.

a. relative minimum: $\left(-4, -358\right)$
b. relative maximum: $\left(-3, -241\right)$
c. relative minimum: $\left(4, 74\right)$
d. relative minimum: $\left(2, 74\right)$
e. relative maximum: $\left(3, 83\right)$

____ 19. For the function $f(x) = 4x^3 - 48x^2 + 6$:

(a) Find the critical numbers of f (if any);
(b) Find the open intervals where the function is increasing or decreasing; and
(c) Apply the First Derivative Test to identify all relative extrema.

Then use a graphing utility to confirm your results.

a. (a) $x = 0$, 2
(b) increasing: $\left(-\infty, 0\right) \cup \left(2, \infty\right)$; decreasing: $\left(0, 2\right)$
(c) relative max: $f(0) = 6$; relative min: $f(2) = -154$

b. (a) $x = 0$, 2
(b) decreasing: $\left(-\infty, 0\right) \cup \left(2, \infty\right)$; increasing: $\left(0, 2\right)$
(c) relative min: $f(0) = 6$; relative max: $f(2) = -154$

c. (a) $x = 0$,2
(b) increasing: $\left(-\infty, 0\right) \cup \left(2, \infty\right)$; decreasing: $\left(0, 2\right)$
(c) relative max: $f(0) = 6$; no relative min.

d. (a) $x = 0$, 8
(b) increasing: $\left(-\infty, 0\right) \cup \left(8, \infty\right)$; decreasing: $\left(0, 8\right)$
(c) relative max: $f(0) = 6$; relative min: $f(8) = -1018$

e. (a) $x = 0$,8
(b) decreasing: $\left(-\infty, 0\right) \cup \left(8, \infty\right)$; increasing: $\left(0, 8\right)$
(c) relative min: $f(0) = 6$; relative max: $f(8) = -1018$

____ 20. Find the relative maxima of $f(x) = \cos^2(4x)$ on the interval $(0, 3.142)$ by applying the First Derivative Test. Round numerical values in your answer to three decimal places.

a. relative maxima: $(1.571, 1), (1.963, 1), (2.356, 13.142)$
b. relative maxima: $(0.393, 0)(1.178, 0), (1.963, 0), (2.749, 0)$
c. relative maxima: $(0.785, 1), (1.571, 1), (2.356, 1)$
d. relative maxima: $(0.393, 1), (1.178, 1), (1.963, 1), (2.749, 1)$
e. relative maxima: $(0.393, 1), (0.785, 1), (1.178, 1)$

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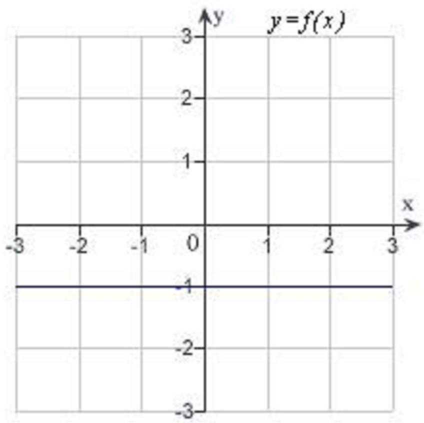
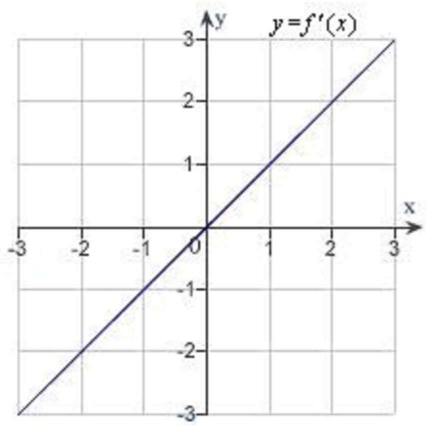
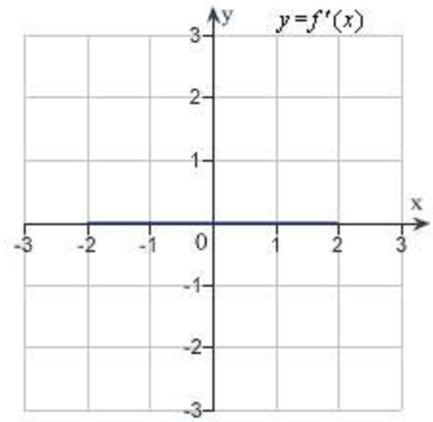
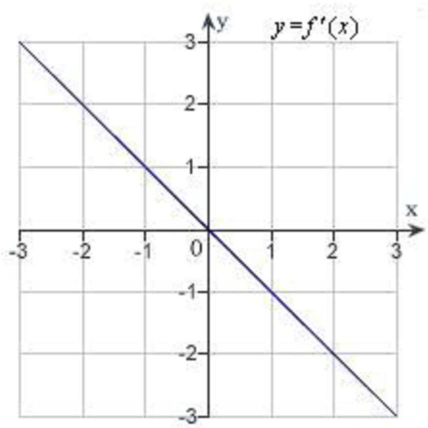
____ 21. The graph of *f* is shown in the figure. Sketch a graph of the derivative of *f*.

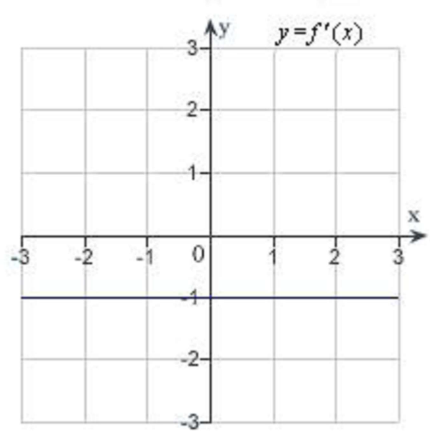


a. 

d. 

b. 

e. The derivative of *f* does not exist.

c. 

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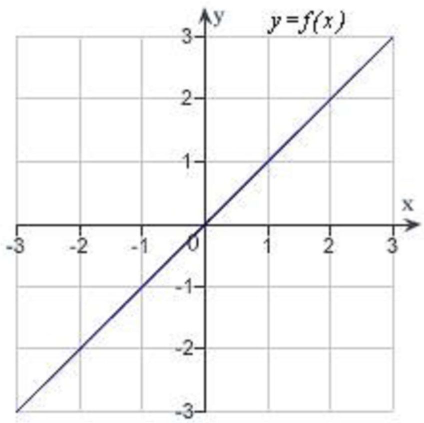
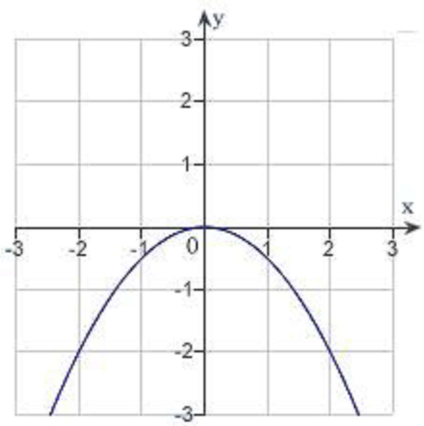
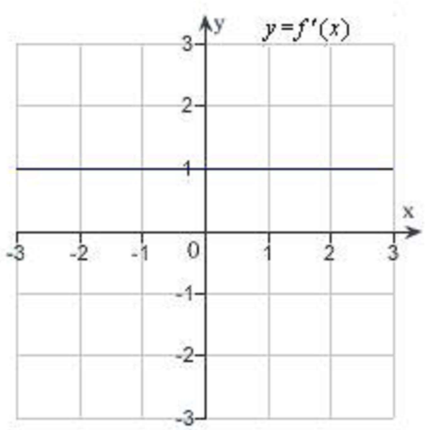
____ 22. The graph of *f* is shown in the figure. Sketch a graph of the derivative of *f*.



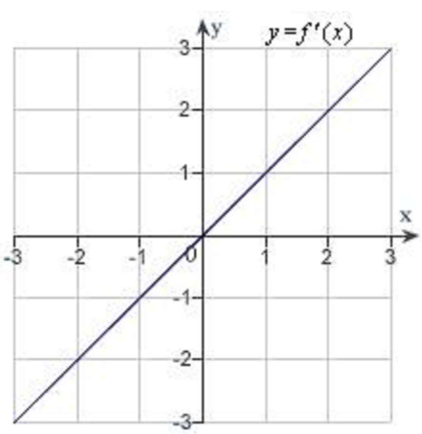
a.



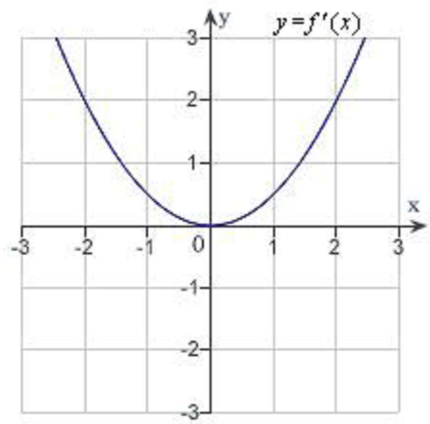
b.



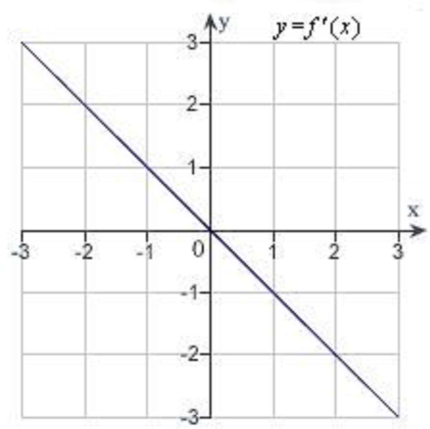
c.



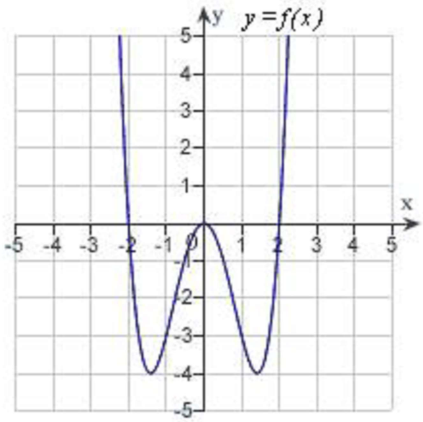
d.



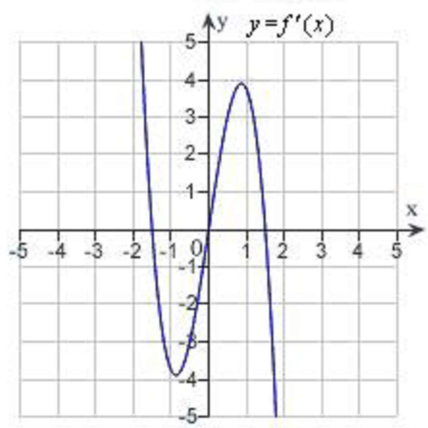
e.



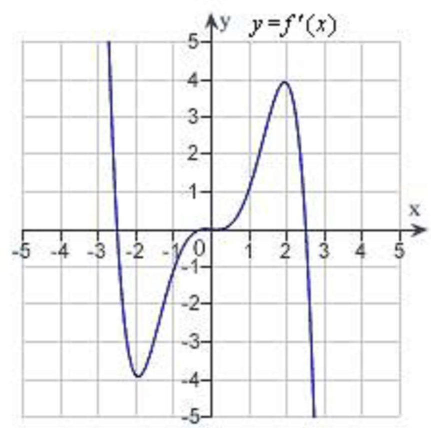
____ 23. The graph of *f* is shown in the figure. Sketch a graph of the derivative of *f*.



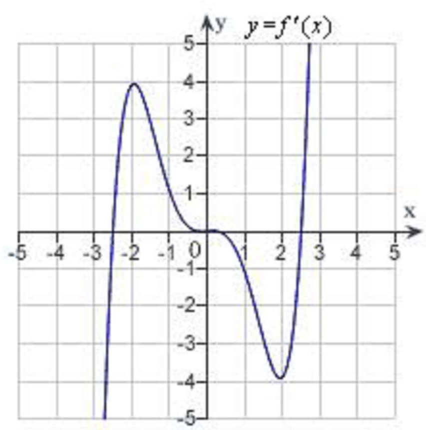
a.



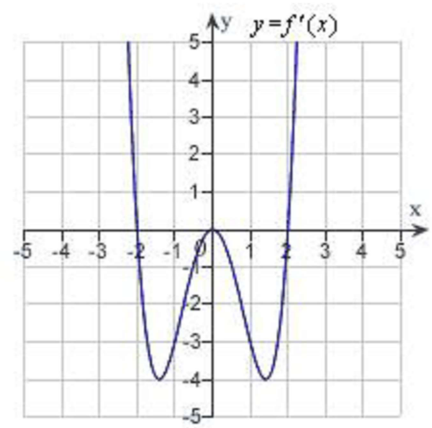
d.



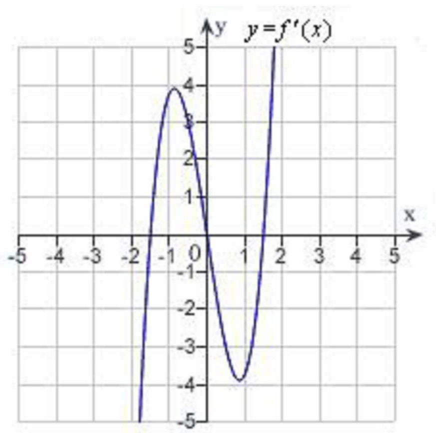
b.



e.



c.



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____ 24. Determine the open intervals on which the graph of $f(x) = 3x^2 + 7x - 3$ is concave downward or concave upward.

a. concave downward on $(-\infty, \infty)$
b. concave upward on $(-\infty, 0)$; concave downward on $(0, \infty)$
c. concave upward on $(-\infty, 1)$; concave downward on $(1, \infty)$
d. concave upward on $(-\infty, \infty)$
e. concave downward on $(-\infty, 0)$; concave upward on $(0, \infty)$

____ 25. Determine the open intervals on which the graph of $y = -6x^3 + 8x^2 + 6x - 5$ is concave downward or concave upward.

a. concave downward on $(-\infty, \infty)$
b. concave upward on $\left(-\infty, -\frac{4}{9}\right)$; concave downward on $\left(-\frac{4}{9}, \infty\right)$
c. concave upward on $\left(-\infty, \frac{4}{9}\right)$; concave downward on $\left(\frac{4}{9}, \infty\right)$
d. concave downward on $\left(-\infty, -\frac{4}{9}\right)$; concave upward on $\left(-\frac{4}{9}, \infty\right)$
e. concave downward on $\left(-\infty, \frac{4}{9}\right)$; concave upward on $\left(\frac{4}{9}, \infty\right)$

____ 26. Find all points of inflection on the graph of the function $f(x) = \frac{1}{2}x^4 + 2x^3$.

a. $(-2, -8)$
b. $(0, 0)$
c. $(0, 0), (-4, 0)$
d. $(0, 0)(-2, -8)$
e. $(-2, -8)$

____ 27. Find all points of inflection, if any exist, of the graph of the function $f(x) = x\sqrt{x+3}$. Round your answers to two decimal places.

a. $(6, 18)$
b. $(1, 2), (3, 7.35)$
c. $(1, 2), (2, 4.47)$
d. $(3, 7.35)$
e. no points of inflection

____ 28. Find all relative extrema of the function $f(x) = -4x^2 - 32x - 62$. Use the Second Derivative Test where applicable.

a. relative max: $f(0) = -62$; no relative min
b. no relative max; no relative min
c. relative min: $f(-4) = 2$; relative max: $f(0) = -62$
d. relative min: $f(-4) = 2$; no relative max
e. relative min: $f(-4) = 2$; relative max: $f(0) = -62$

____ 29. Find all relative extrema of the function $f(x) = 2x^4 - 32x^3 + 4$. Use the Second Derivative Test where applicable.

a. relative max: $\left(24, 221188\right)$; no relative min
b. relative min: $\left(12, -13820\right)$; no relative max
c. relative min: $\left(24, 221188\right)$; no relative max
d. relative max: $\left(12, 13820\right)$; no relative min
e. no relative max or min

____ 30. Find all relative extrema of the function $f(x) = x^{2/3} - 6$. Use the Second Derivative Test where applicable.

a. relative minimum: $\left(0, -6\right)$
b. relative minimum: $\left(0, -5\right)$
c. relative maximum: $\left(0, -6\right)$
d. relative minimum: $\left(0, 2\right)$
e. relative maximum: $\left(0, 5\right)$

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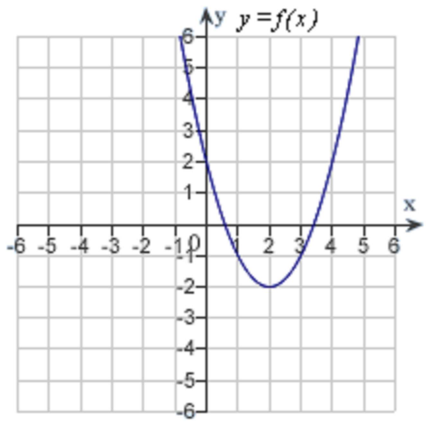
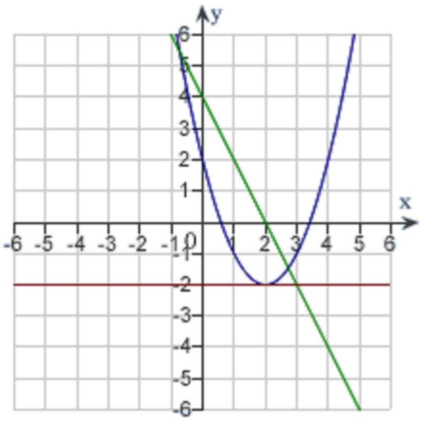
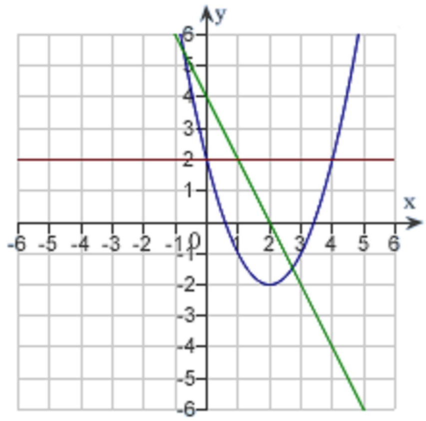
____ 31. The graph of f is shown. Graph f, f' and f'' on the same set of coordinate axes.



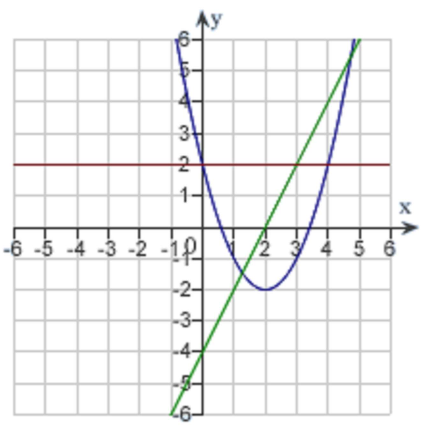
a.



d.

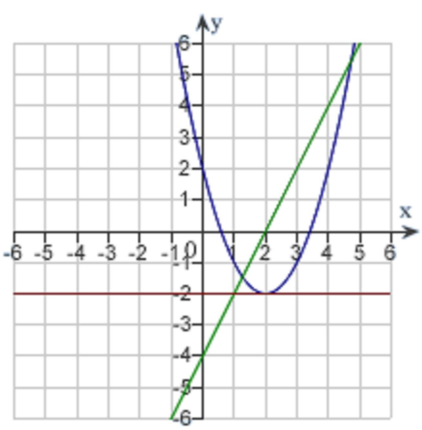


b.



e. none of the above

c.

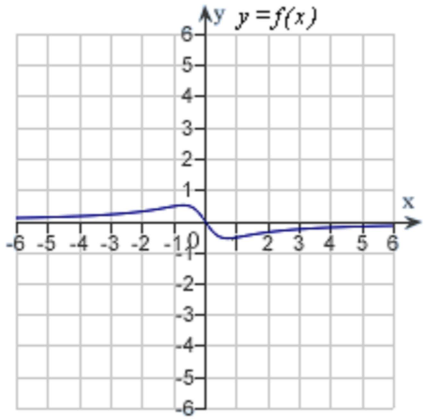


____ 32. Suppose a manufacturer has determined that the total cost C of operating a factory is $C = 0.6x^2 + 14x + 54{,}000$ where x is the number of units produced. At what level of production will the average cost per unit be minimized? (The average cost per unit is C/x.)

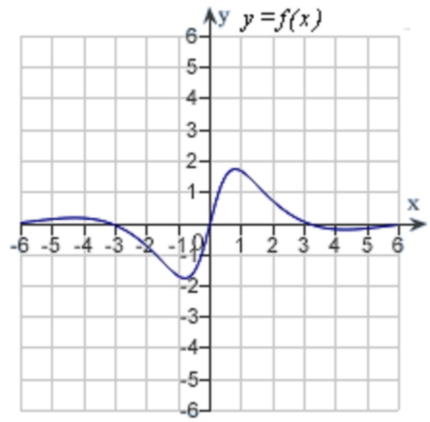
a. $x = 300$ units
b. $x = 330$ units
c. $x = 30$ units
d. $x = 60$ units
e. $x = 600$ units

____ 33. Match the function $f(x) = \dfrac{2x^2}{x^2 + 2}$ with one of the following graphs.

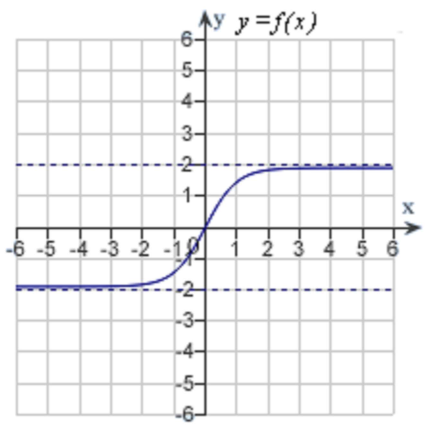
a.



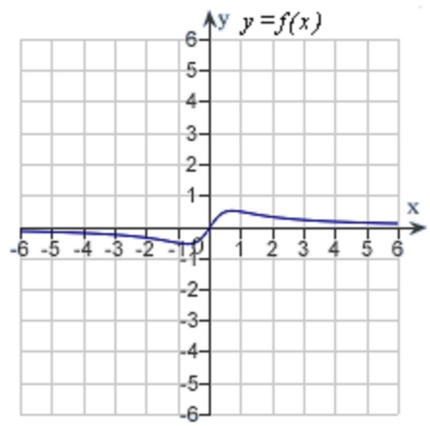
d.



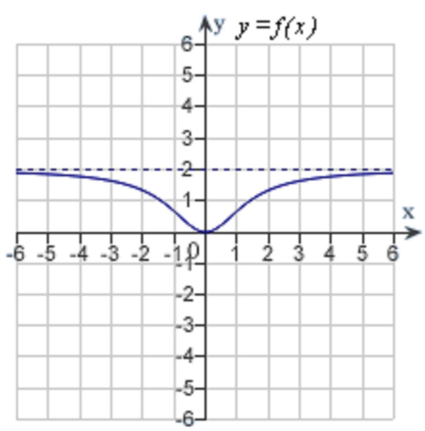
b.



e.



c.



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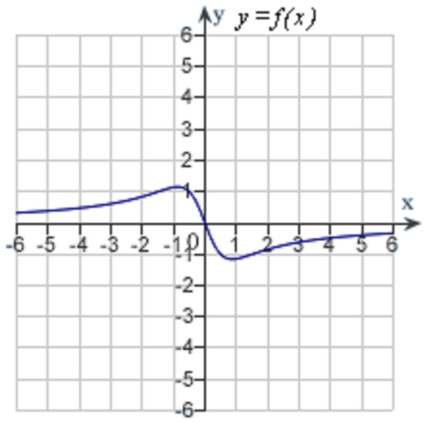
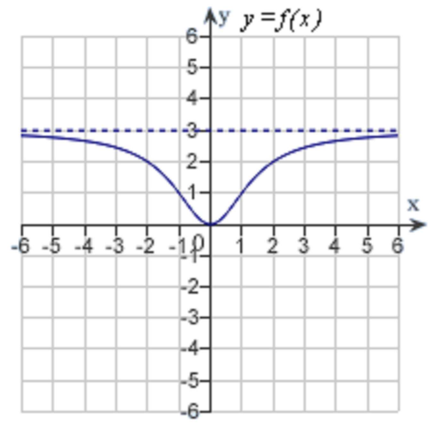
____ 34. Match the function $f(x) = \dfrac{3x}{x^2 + 2}$ with one of the following graphs.

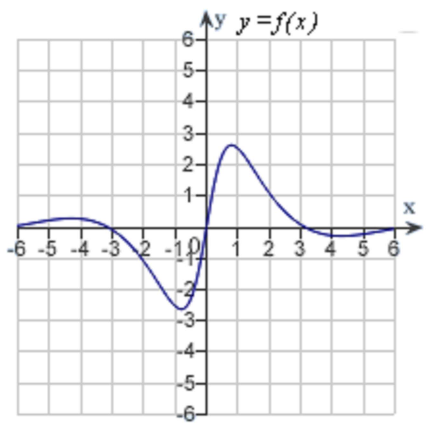
a.



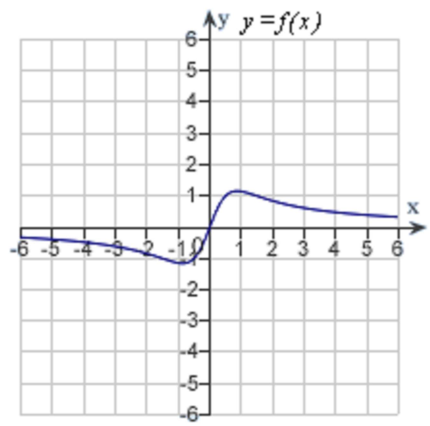
d.



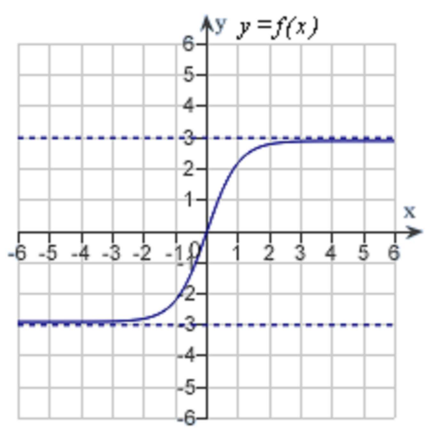
b.



e.



c.



____ 35. For the function $f(x) = \dfrac{4x+3}{5x+6}$, use a graphing utility to complete the table and estimate the limit as x approaches infinity.

x	10^0	10^1	10^2	10^3	10^4	10^5	10^6
$f(x)$							

a. 0.8000

b. 1.8000

c. 1.2500

d. 2.2500

e. 0.2500

____ 36. Find the limit.

$$\lim_{x \to \infty} \left(5 + \frac{3}{x^2}\right)$$

a. ∞

b. 3

c. $-\infty$

d. -3

e. 5

____ 37. Find the limit.

$$\lim_{x \to \infty} \frac{7x+6}{\sqrt{64x^2+2x}}$$

a. $\dfrac{7}{8}$

b. $\dfrac{7}{64}$

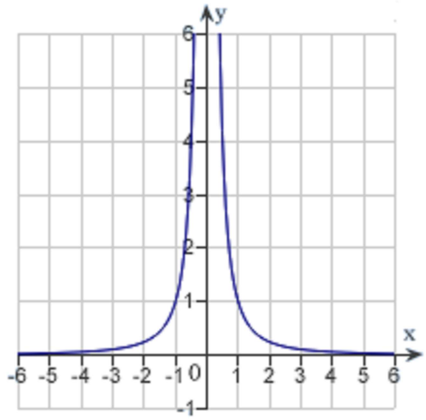
c. 1

d. 7

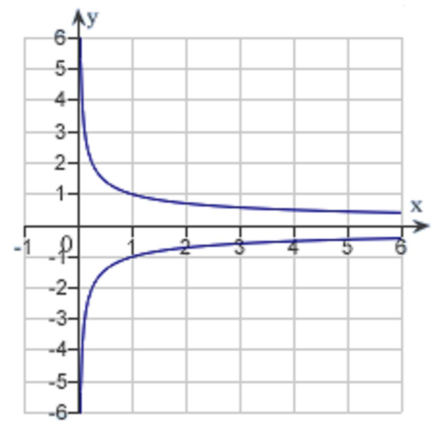
e. ∞

____ 38. Sketch the graph of the function $f(x) = \dfrac{1+x}{1-x}$ using any extrema, intercepts, symmetry, and asymptotes.

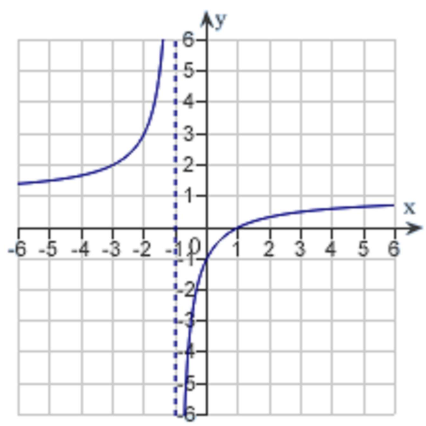
a.



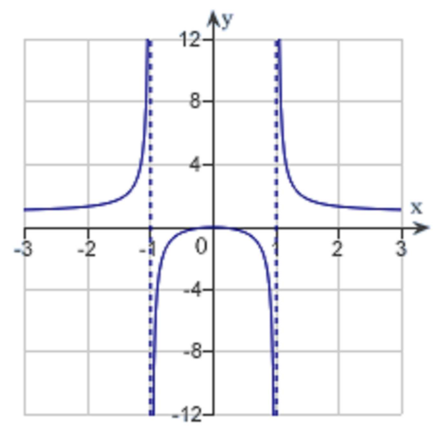
d.



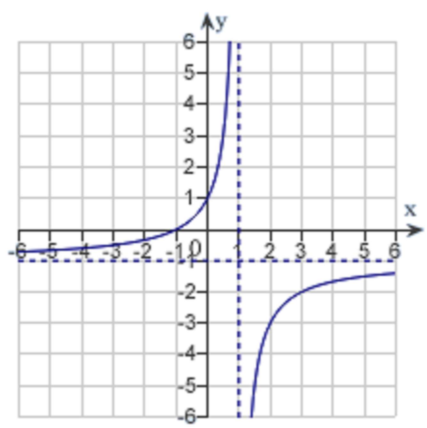
b.



e.



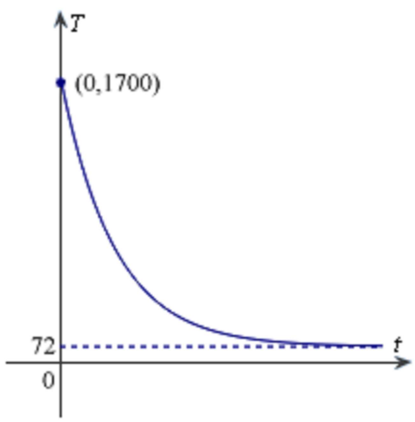
c.



____ 39. A business has a cost of $C = 1.5x + 500$ for producing x units. The average cost per unit is $\overline{C} = \dfrac{C}{x}$. Find the limit of $\overline{C}$ as x approaches infinity.

a. 333.3
b. 1
c. 500
d. 0
e. 1.5

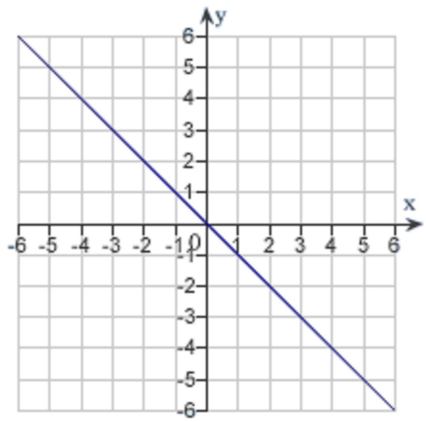
____ 40. The graph shows the temperature T, in degrees Fahrenheit, of molten glass t seconds after it is removed from a kiln.



Find $\lim\limits_{t \to \infty} T$.

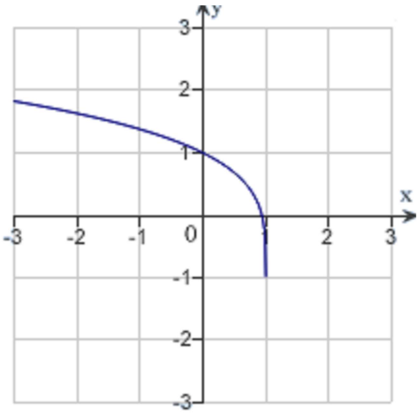
a. 1772°
b. 72°
c. 1700°
d. 89°
e. 1628°

____ 41. The graph of a function f is is shown below.

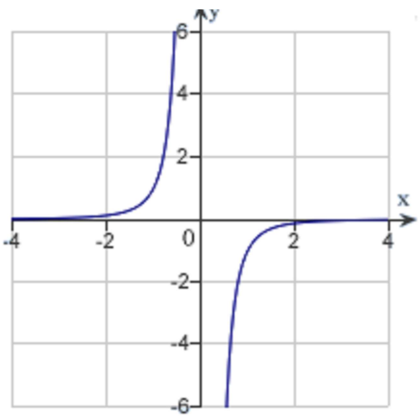


Sketch the graph of the derivative $f\,'$.

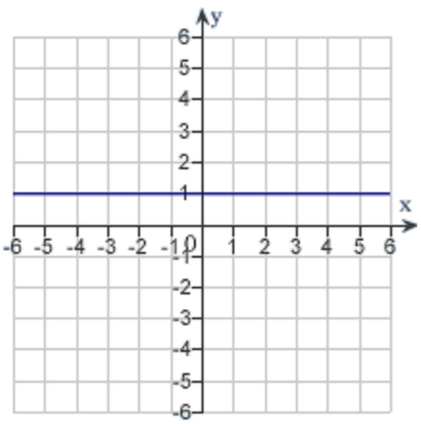
a.


y
x
3
2
1
0
-1
-2
-3
-3 -2 -1 1 2 3

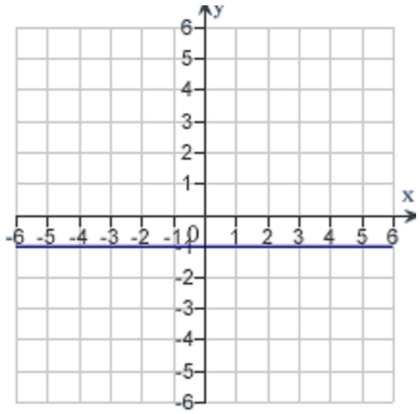
b.


y
x
6
4
2
0
-2
-4
-6
-4 -2 2 4

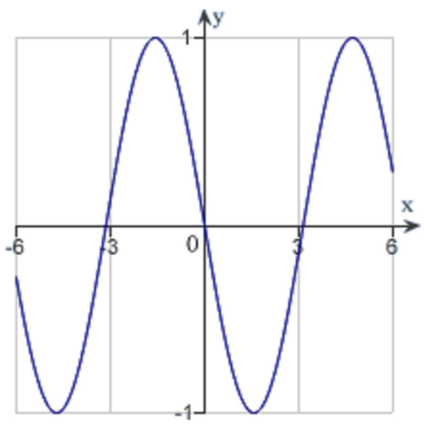
c.


y
x
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-6 -5 -4 -3 -2 -1 1 2 3 4 5 6

d.

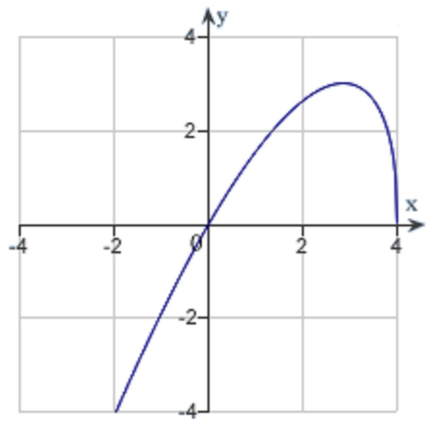

y
x
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-6 -5 -4 -3 -2 -1 1 2 3 4 5 6

e.

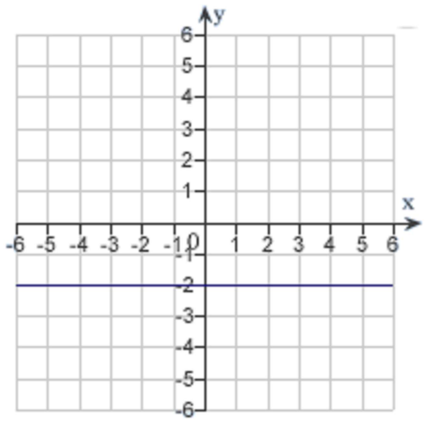

y
x
1
0
-1
-6 -3 3 6

Name: ________________________ **ID: A**

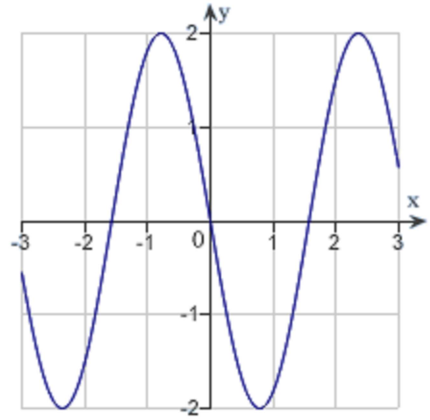
____ 42. The graph of a function f is is shown below. Sketch the graph of the derivative $f\,'$.



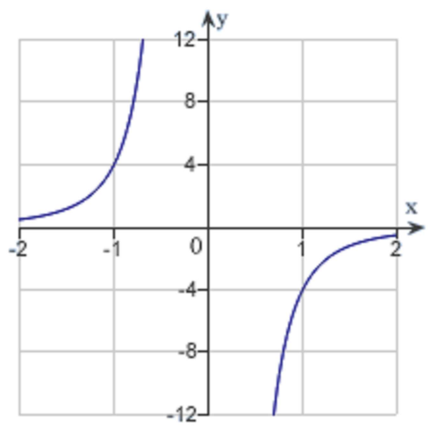
a.


y
x
6
5
4
3
2
1
-1
-2
-3
-4
-5
-6
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6

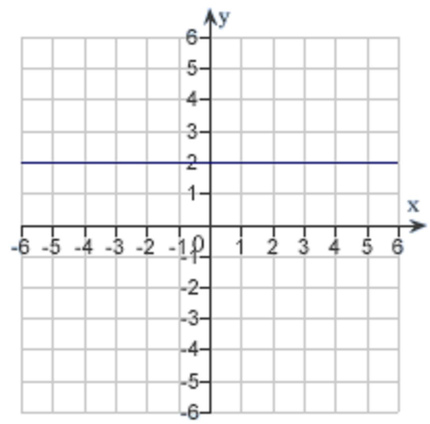
d.


y
x
2
1
-1
-2
-3 -2 -1 0 1 2 3

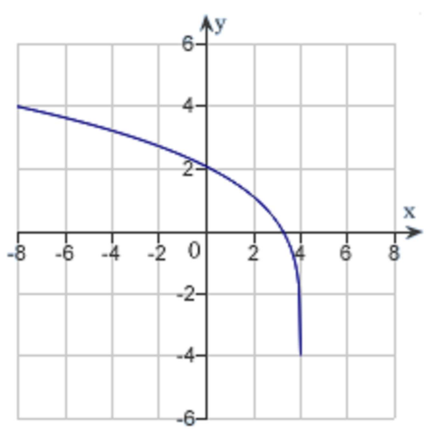
b.


y
x
12
8
4
-4
-8
-12
-2 -1 0 1 2

e.


y
x
6
5
4
3
2
1
-1
-2
-3
-4
-5
-6
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6

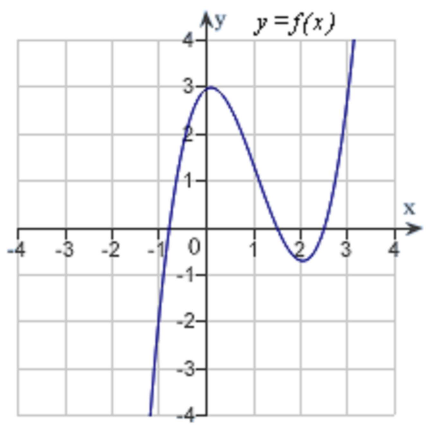
c.


y
x
6
4
2
-2
-4
-6
-8 -6 -4 -2 0 2 4 6 8

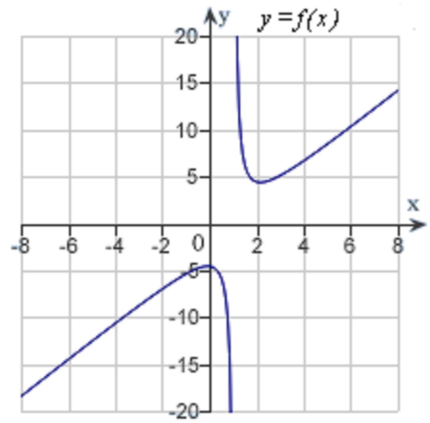
Name: ________________________ ID: A

____ 43. Analyze and sketch a graph of the function $f(x) = \dfrac{x^2 - 2x + 9}{x}$.

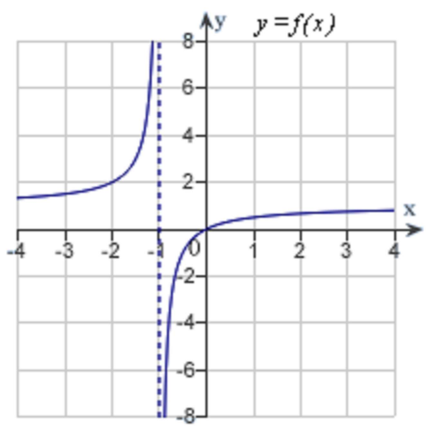
a.



d.

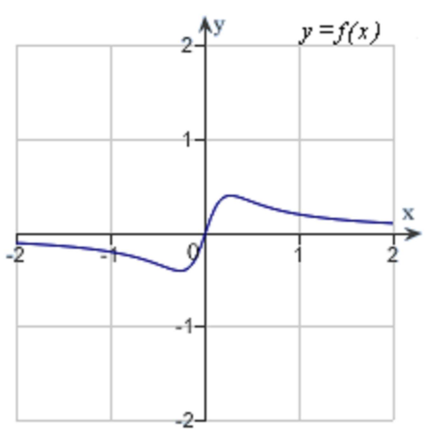


b.



e. none of the above

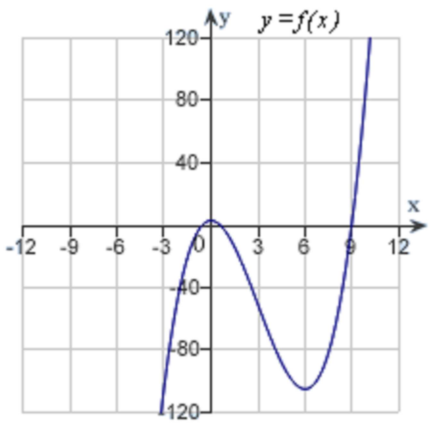
c.



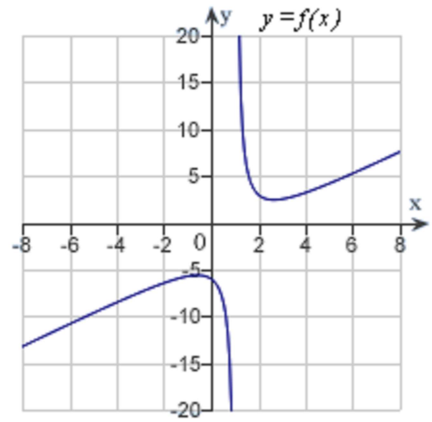
Name: ________________________ ID: A

____ 44. Analyze and sketch a graph of the function $y = 2 - 3x - x^3$.

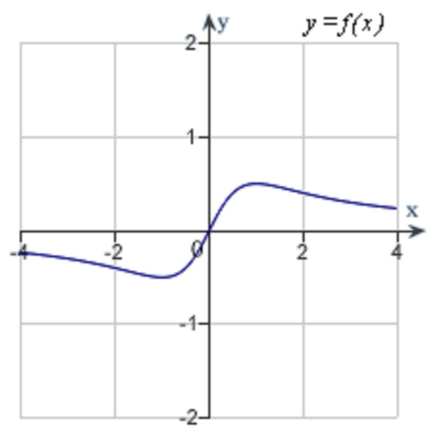
a.



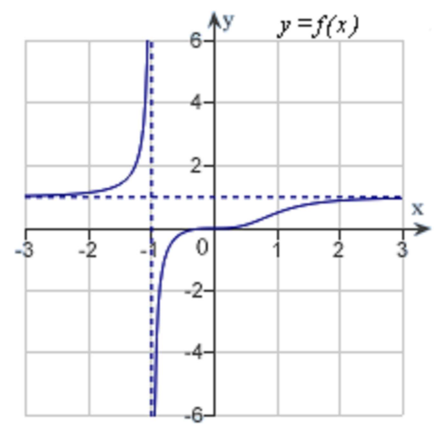
d.



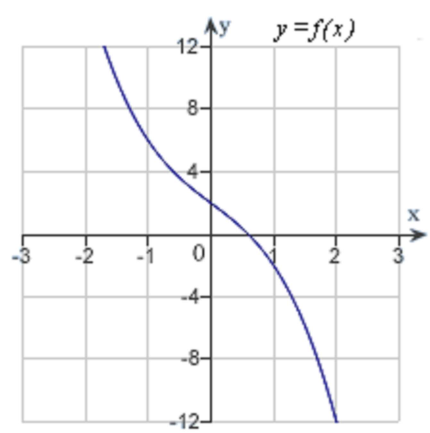
b.



e.



c.



____ 45. Find two positive numbers whose product is 181 and whose sum is a minimum.

a. $\sqrt{181}, \sqrt{181}$
b. $2\sqrt{181}, \dfrac{\sqrt{181}}{2}$
c. $0, 181$
d. $1, 181$
e. $3\sqrt{181}, \dfrac{\sqrt{181}}{3}$

____ 46. Find the length and width of a rectangle that has perimeter 48 meters and a maximum area.

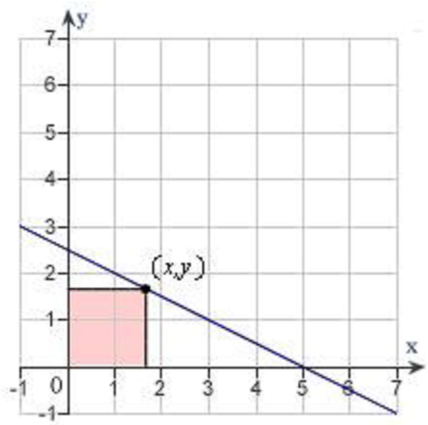
a. 12 m; 12 m.
b. 16 m; 9 m.
c. 1m; 23 m.
d. 13 m; 11 m.
e. 6 m; 18 m.

____ 47. Find the point on the graph of the function $f(x) = \sqrt{x}$ that is closest to the point $(18, 0)$.

a. $\left(\dfrac{35}{2}, \sqrt{\dfrac{35}{2}}\right)$
b. $\left(\dfrac{37}{2}, \sqrt{\dfrac{37}{2}}\right)$
c. $\left(\dfrac{35}{2}, \sqrt{\dfrac{37}{2}}\right)$
d. $\left(\sqrt{\dfrac{37}{2}}, \dfrac{35}{2}\right)$
e. $\left(\sqrt{\dfrac{35}{2}}, \dfrac{35}{2}\right)$

Name: ________________________ **ID: A**

____ 48. A rectangle is bounded by the x- and y-axes and the graph of $y = \dfrac{(5-x)}{2}$ (see figure). What length and width should the rectangle have so that its area is a maximum?

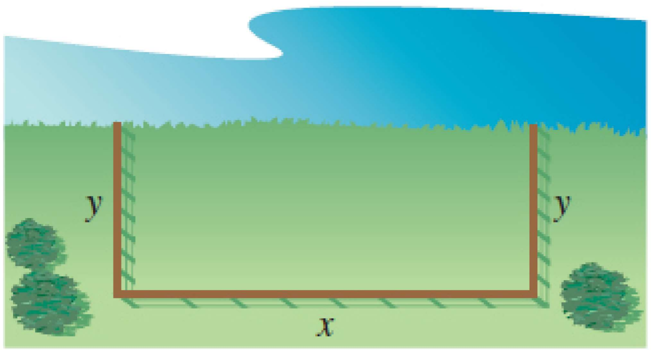


a. $x = 2.5$; $y = 3$
b. $x = 3$; $y = 5$
c. $x = 2.5$; $y = 1.25$
d. $x = 5$; $y = 3$
e. $x = 1.25$; $y = 2.5$

____ 49. A solid is formed by adjoining two hemispheres to the ends of a right circular cylinder. The total volume of the solid is 23 cubic centimeters. Find the radius, r, of the cylinder that produces the minimum surface area. Round your answer to two decimal places.

a. $r \approx 1.76\,\text{cm}$
b. $r \approx 2.3\,\text{cm}$
c. $r \approx 2.34\,\text{cm}$
d. $r \approx 2.1\,\text{cm}$
e. $r \approx 3.12\,\text{cm}$

____ 50. A farmer plans to fence a rectangular pasture adjacent to a river (see figure). The pasture must contain 720,000 square meters in order to provide enough grass for the herd. No fencing is needed along the river. What dimensions will require the least amount of fencing?



a. $x = 600$ and $y = 1200$
b. $x = 1000$ and $y = 720$
c. $x = 1200$ and $y = 600$
d. $x = 720$ and $y = 1000$
e. none of the above

Chapter 3 Practice
Answer Section

MULTIPLE CHOICE

1. ANS: A PTS: 1 DIF: Easy REF: Section 3.1
OBJ: Understand the relationship between the value of the derivative and the extremum of a function
MSC: Skill
2. ANS: B PTS: 1 DIF: Medium REF: Section 3.1
OBJ: Identify the critical numbers of a function MSC: Skill
3. ANS: C PTS: 1 DIF: Easy REF: Section 3.1
OBJ: Locate the absolute extrema of a function on a given closed interval
MSC: Skill
4. ANS: C PTS: 1 DIF: Medium REF: Section 3.1
OBJ: Locate the absolute extrema of a function on a given closed interval
MSC: Skill
5. ANS: C PTS: 1 DIF: Medium REF: Section 3.1
OBJ: Locate the absolute extrema of a function on a given closed interval
MSC: Skill
6. ANS: A PTS: 1 DIF: Medium REF: Section 3.1
OBJ: Locate the absolute extrema of a function on a given closed interval
MSC: Skill
7. ANS: C PTS: 1 DIF: Medium REF: Section 3.1
OBJ: Graph a function using graphing utility and locate the absolute extrema on a given closed interval
MSC: Skill
8. ANS: C PTS: 1 DIF: Easy REF: Section 3.2
OBJ: Identify all values of c guaranteed by Rolle's Theorem MSC: Skill
9. ANS: A PTS: 1 DIF: Medium REF: Section 3.2
OBJ: Identify all values of c guaranteed by Rolle's Theorem MSC: Skill
10. ANS: E PTS: 1 DIF: Medium REF: Section 3.2
OBJ: Identify all values of c guaranteed by Rolle's Theorem MSC: Skill
11. ANS: A PTS: 1 DIF: Medium REF: Section 3.2
OBJ: Identify all values of c guaranteed by the Mean Value Theorem
MSC: Skill
12. ANS: C PTS: 1 DIF: Medium REF: Section 3.2
OBJ: Identify all values of c guaranteed by the Mean Value Theorem
MSC: Skill
13. ANS: B PTS: 1 DIF: Easy REF: Section 3.2
OBJ: Interpret the difference quotient in the MVT in applications
MSC: Application
14. ANS: C PTS: 1 DIF: Medium REF: Section 3.2
OBJ: Identify all values of c guaranteed by the Mean Value Theorem in applications
MSC: Application
15. ANS: B PTS: 1 DIF: Easy REF: Section 3.3
OBJ: Estimate the intervals where a function is increasing and decreasing from a graph
MSC: Skill

16. ANS: D PTS: 1 DIF: Medium REF: Section 3.3
OBJ: Identify the intervals on which a function is increasing or decreasing
MSC: Skill
17. ANS: B PTS: 1 DIF: Easy REF: Section 3.3
OBJ: Identify the critical numbers of a function MSC: Skill
18. ANS: E PTS: 1 DIF: Easy REF: Section 3.3
OBJ: Identify the relative extrema of a function by applying the First Derivative Test
MSC: Skill
19. ANS: D PTS: 1 DIF: Medium REF: Section 3.3
OBJ: Identify the relative extrema of a function by applying the First Derivative Test; Identify the relative extrema of the function MSC: Skill
20. ANS: C PTS: 1 DIF: Medium REF: Section 3.3
OBJ: Identify the relative extrema of a function by applying the First Derivative Test
MSC: Skill
21. ANS: D PTS: 1 DIF: Medium REF: Section 3.3
OBJ: Graph a function's derivative given the graph of the function
MSC: Skill
22. ANS: B PTS: 1 DIF: Medium REF: Section 3.3
OBJ: Graph a function's derivative given the graph of the function
MSC: Skill
23. ANS: C PTS: 1 DIF: Medium REF: Section 3.3
OBJ: Graph a function's derivative given the graph of the function
MSC: Skill
24. ANS: D PTS: 1 DIF: Medium REF: Section 3.4
OBJ: Identify the intervals on which a function is concave up or concave down
MSC: Skill
25. ANS: C PTS: 1 DIF: Medium REF: Section 3.4
OBJ: Identify the intervals on which a function is concave up or concave down
MSC: Skill
26. ANS: D PTS: 1 DIF: Easy REF: Section 3.4
OBJ: Identify all points of inflection for a function MSC: Skill
27. ANS: E PTS: 1 DIF: Medium REF: Section 3.4
OBJ: Identify all points of inflection for a function MSC: Skill
28. ANS: D PTS: 1 DIF: Medium REF: Section 3.4
OBJ: Identify all relative extrema for a function using the Second Derivative Test
MSC: Skill
29. ANS: B PTS: 1 DIF: Medium REF: Section 3.4
OBJ: Identify all relative extrema for a function using the Second Derivative Test
MSC: Skill
30. ANS: A PTS: 1 DIF: Medium REF: Section 3.4
OBJ: Identify all relative extrema for a function using the Second Derivative Test
MSC: Skill
31. ANS: D PTS: 1 DIF: Medium REF: Section 3.4
OBJ: Graph a function's derivative and second derivative given the graph of the function
MSC: Skill
32. ANS: A PTS: 1 DIF: Medium REF: Section 3.4
OBJ: Identify all relative extrema for a function in applications
MSC: Application

33. ANS: C PTS: 1 DIF: Medium REF: Section 3.5
OBJ: Identify the graph that matches the given function MSC: Skill
34. ANS: E PTS: 1 DIF: Medium REF: Section 3.5
OBJ: Identify the graph that matches the given function MSC: Skill
35. ANS: A PTS: 1 DIF: Medium REF: Section 3.5
OBJ: Estimate a limit at infinity from a table of values MSC: Skill
36. ANS: E PTS: 1 DIF: Medium REF: Section 3.5
OBJ: Evaluate the limit of a function at infinity MSC: Skill
37. ANS: A PTS: 1 DIF: Medium REF: Section 3.5
OBJ: Evaluate the limit of a function at infinity MSC: Skill
38. ANS: C PTS: 1 DIF: Medium REF: Section 3.5
OBJ: Graph a function using extrema, intercepts, symmetry, and asymptotes
MSC: Skill
39. ANS: E PTS: 1 DIF: Easy REF: Section 3.5
OBJ: Evaluate limits at infinity in applications MSC: Application
40. ANS: B PTS: 1 DIF: Easy REF: Section 3.5
OBJ: Evaluate limits at infinity in applications MSC: Application
41. ANS: D PTS: 1 DIF: Medium REF: Section 3.6
OBJ: Graph a function's derivative given the graph of the function
MSC: Skill
42. ANS: C PTS: 1 DIF: Medium REF: Section 3.6
OBJ: Graph a function's derivative given the graph of the function
MSC: Skill
43. ANS: E PTS: 1 DIF: Medium REF: Section 3.6
OBJ: Graph a function using extrema, intercepts, symmetry, and asymptotes
MSC: Skill
44. ANS: C PTS: 1 DIF: Medium REF: Section 3.6
OBJ: Graph a function using extrema, intercepts, symmetry, and asymptotes
MSC: Skill
45. ANS: A PTS: 1 DIF: Easy REF: Section 3.7
OBJ: Apply calculus techniques to solve a minimum/maximum problem involving the sum of two numbers
MSC: Application
46. ANS: A PTS: 1 DIF: Medium REF: Section 3.7
OBJ: Apply calculus techniques to solve a minimum/maximum problem involving the area of a rectangle
MSC: Application
47. ANS: A PTS: 1 DIF: Medium REF: Section 3.7
OBJ: Apply calculus techniques to solve a minimum/maximum problem involving the distance between points MSC: Application
48. ANS: C PTS: 1 DIF: Difficult REF: Section 3.7
OBJ: Apply calculus techniques to solve a minimum/maximum problem involving the area of a rectangle bounded beneath a line MSC: Application
49. ANS: A PTS: 1 DIF: Medium REF: Section 3.7
OBJ: Apply calculus techniques to solve a minimum/maximum problem involving the surface area of a cylinder MSC: Application
50. ANS: B PTS: 1 DIF: Easy REF: Section 3.7
OBJ: Apply calculus techniques to solve a minimum/maximum problem involving the area of a rectangle
MSC: Application