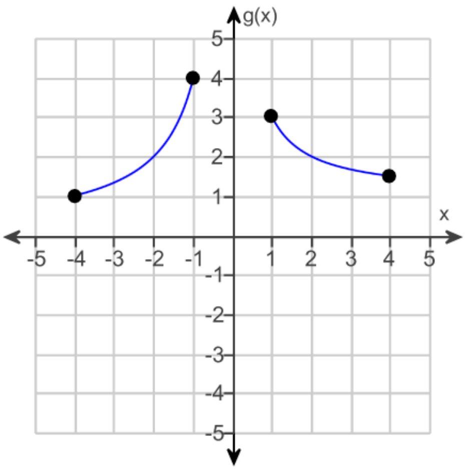
Student: ____________________ **Date:** ____________________	**Instructor:** Robert Brown **Course:** Calculus I Spring 2019 Math 1540 Dr. Bob Brown CRN 20506	**Assignment:** Calculus I Test 3 Practice

1. Find the location of the indicated absolute extremum for the function.

Extremum: Maximum



- A. $x = 1$
- B. $x = 4$
- C. No maximum
- D. $x = -1$

ID: 4.1-7

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2. Find the absolute extreme values of the function on the interval.

$F(x) = -\frac{1}{x^2}, \ 0.5 \le x \le 3$

- A. absolute maximum is $-\frac{1}{9}$ at $x = \frac{1}{2}$; absolute minimum is -4 at $x = -3$
- B. absolute maximum is $\frac{1}{9}$ at $x = \frac{1}{2}$; absolute minimum is -4 at $x = 3$
- C. absolute maximum is $-\frac{1}{9}$ at $x = 3$; absolute minimum is -4 at $x = \frac{1}{2}$
- D. absolute maximum is $-\frac{1}{9}$ at $x = 3$; absolute minimum is -4 at $x = -\frac{1}{2}$

ID: 4.1-26

3. Find the critical points, domain endpoints, and local extreme values for the function.

$$y = \begin{cases} -x^2 - 9x + 8, & x \le 1 \\ -x^2 + 3x - 4, & x > 1 \end{cases}$$

What is/are the critical point(s) or domain endpoint(s) where f′ is undefined? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The critical point(s) or domain endpoint(s) where f′ is undefined is/are at x = __________.
  (Type an integer or a simplified fraction. Use a comma to separate answers as needed.)
- **B.** There are no critical points or domain endpoints where f′ is undefined.

What is/are the critical point(s) where f′ is 0? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The critical point(s) where f′ is 0 is/are at x = __________.
  (Type an integer or a simplified fraction. Use a comma to separate answers as needed.)
- **B.** There are no critical points where f′ is 0.

From the critical point(s) and domain endpoint(s), what is/are the point(s) corresponding to local maxima? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The point(s) corresponding to the local maxima is/are __________.
  (Type an ordered pair. Simplify your answer. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- **B.** There are no points corresponding to local maxima.

From the critical point(s) and domain endpoint(s), what is/are the point(s) corresponding to local minima? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The point(s) corresponding to the local minima is/are __________.
  (Type an ordered pair. Simplify your answer. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- **B.** There are no points corresponding to local minima.

ID: 4.1.75

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4. Find the value or values of c that satisfy the equation $\frac{f(b) - f(a)}{b - a} = f'(c)$ in the conclusion of the Mean Value Theorem for the following function and interval.

$f(x) = 4x^2 + 4x - 3, \qquad [-2,1]$

The value(s) of c that satisfy the equation $\frac{f(b) - f(a)}{b - a} = f'(c)$ is/are __________.
(Type a simplified fraction. Use a comma to separate answers as needed.)

ID: 4.2.1

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5. Find the value or values of c that satisfy the equation $\frac{f(b)-f(a)}{b-a} = f'(c)$ in the conclusion of the mean value theorem for the given function and interval.

$f(x) = 9x + \frac{9}{x}, \left[\frac{1}{18}, 18\right]$

c = ____________ (Use a comma to separate answers as needed.)

ID: 4.2.3

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6. Identify the function's local and absolute extreme values, if any, saying where they occur.

$f(x) = -x^3 - 9x^2 - 24x + 2$

- **A.** local maximum at $x = 4$; local minimum at $x = 2$
- **B.** local maximum at $x = 2$; local minimum at $x = 4$
- **C.** local maximum at $x = -2$; local minimum at $x = -4$
- **D.** local maximum at $x = -4$; local minimum at $x = -2$

ID: 4.3-22

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7. Find the largest open interval where the function is changing as requested.

Where $y = (x^2 - 9)^2$ is increasing

- **A.** $(-\infty, 0)$
- **B.** $(3, \infty)$
- **C.** $(-3, 3)$
- **D.** $(-3, 0)$

ID: 4.3-17

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8. Find the absolute maximum and minimum values of $f(x) = \ln(\sin x)$ on $\left[\frac{\pi}{6}, \frac{2\pi}{3}\right]$.

- **A.** Maximum = 0 at $x = \frac{\pi}{2}$, minimum = $-\ln 2$ at $x = \frac{\pi}{6}$
- **B.** Maximum = 0 at $x = \frac{\pi}{2}$, minimum = $\ln\frac{\sqrt{3}}{2}$ at $x = \frac{2\pi}{3}$
- **C.** Maximum = 0 at $x = 0$, minimum = $-\ln 2$ at $x = \frac{\pi}{6}$
- **D.** Maximum = 0 at $x = \frac{\pi}{2}$, minimum = $-\ln 2$ at $x = \frac{2\pi}{3}$

ID: 4.3-32

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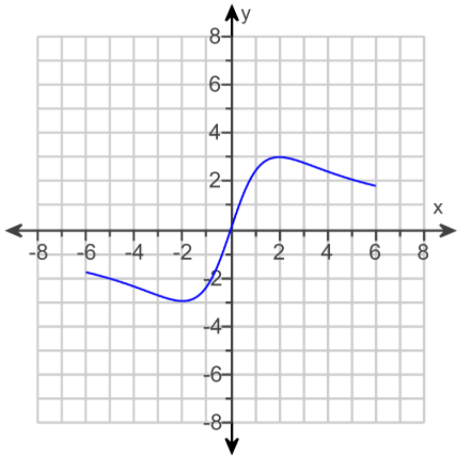
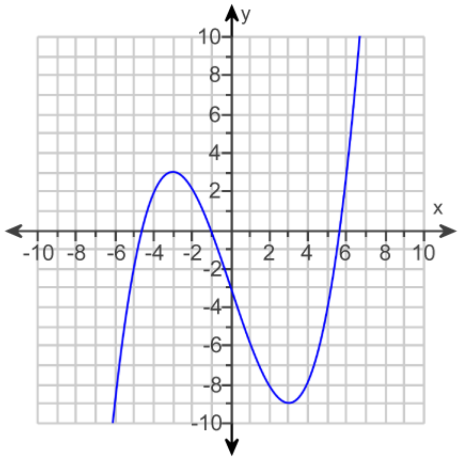
9. Find the open intervals on which the function is increasing and decreasing. Identify the function's local and absolute extreme values, if any, saying where they occur.



ID: 4.3-12

- **A.** increasing on $(-2, 2)$; decreasing on $(-6,0)$; absolute maximum at $(2,3)$; absolute minimum at $(-2,-3)$
- **B.** increasing on $(-2,2)$; decreasing on $(-6,-2)$ and $(2,6)$; absolute maximum at $(2,3)$; absolute minimum at $(-2,-3)$
- **C.** increasing on $(-2, 2)$; decreasing on $(-6,-2)$ and $(2,6)$; no absolute maximum; no absolute minimum
- **D.** increasing on $(-2,2)$; decreasing on $(0,6)$; absolute maximum at $(2,3)$; absolute minimum at $(-2,-3)$

10. Use the graph of the function f(x) to locate the local extrema and identify the intervals where the function is concave up and concave down.



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- **A.** Local minimum at $x=3$; local maximum at $x=-3$; concave down on $(0,\infty)$; concave up on $(-\infty,0)$
- **B.** Local minimum at $x=3$; local maximum at $x=-3$; concave down on $(-\infty,-3)$ and $(3,\infty)$; concave up on $(-3,3)$
- **C.** Local minimum at $x=3$; local maximum at $x=-3$; concave up on $(0,\infty)$; concave down on $(-\infty,0)$
- **D.** Local minimum at $x=3$; local maximum at $x=-3$; concave up on $(-\infty,-3)$ and $(3,\infty)$; concave down on $(-3,3)$

11. Use l'Hôpital's Rule to find the limit.

$$\lim_{t\to -5} \frac{t^3-6t+95}{t^2-t-30}$$

$$\lim_{t\to -5} \frac{t^3-6t+95}{t^2-t-30} = \underline{\hspace{3cm}}$$ (Type an exact answer.)

ID: 4.5.9

12. Use l'Hôpital's Rule to find the limit.

$$\lim_{y\to 0} \frac{\sqrt{y+25}-5}{y}$$

$$\lim_{y\to 0} \frac{\sqrt{y+25}-5}{y} = \underline{\qquad\qquad}$$ (Type an integer or a simplified fraction.)

ID: 4.5.36

13. Use l'Hôpital's Rule to find the limit.

$$\lim_{t\to \infty} \frac{e^{t}+t^2}{2e^{t}-t}$$

$$\lim_{t\to \infty} \frac{e^{t}+t^2}{2e^{t}-t} = \underline{\qquad\qquad}$$ (Type an exact answer.)

ID: 4.5.45

14. Find the number of units that must be produced and sold in order to yield the maximum profit, given the equations for revenue and cost shown below.

$R(x) = 30x - 0.5x^2$
$C(x) = 2x + 6$

- **A.** 28 units
- **B.** 29 units
- **C.** 32 units
- **D.** 34 units

ID: 4.6-7

15. Find the most general antiderivative.

$$\int \left(6t^2 + \frac{t}{7}\right) dt$$

- **A.** $12t + \frac{1}{7} + C$
- **B.** $2t^3 + \frac{t^2}{14} + C$
- **C.** $18t^3 + \frac{2}{7}t^2 + C$
- **D.** $2t^3 + t + C$

ID: 4.8-10

16. Find the most general antiderivative.

$$\int \left(\sqrt{t} - \sqrt[4]{t}\right) dt$$

- **A.** $\frac{3}{2}t^{\frac{3}{2}} - \frac{5}{4}t^{\frac{5}{4}} + C$
- **B.** $\frac{2}{3}t^{\frac{3}{2}} - \frac{4}{5}t^{\frac{5}{4}} + C$
- **C.** $\sqrt{t} - \sqrt[3]{t} + C$
- **D.** $\frac{-1}{2}t^{\frac{1}{2}} - \frac{1}{4}t^{-\frac{3}{4}} + C$

ID: 4.8-12

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17. Find the most general antiderivative.

$$\int \left(\frac{5}{\sqrt{1-x^2}} - \frac{2}{x}\right) dx$$

- **A.** $\frac{\sin^{-1}x}{5} - \frac{\ln|x|}{2} + C$
- **B.** $5\sin^{-1}x + 2\ln|x| + C$
- **C.** $5\sin^{-1}x - \ln|x| + C$
- **D.** $5\sin^{-1}x - 2\ln|x| + C$

ID: 4.8-18

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18. Find the curve y = f(x) in the xy-plane that has the given properties.

$\frac{d^2y}{dx^2} = 36x$; the graph of y passes through the point (0,5) and has a horizontal tangent there.

- **A.** $y = 6x^3 - 5$
- **B.** $y = 18x^2 + 5$
- **C.** $y = 18x^3 + 5$
- **D.** $y = 6x^3 + 5$

ID: 4.8-28

19. Find the largest open interval where the function is changing as requested.

Where $f(x) = x^3 - 4x$ is decreasing

A. $(-\infty, \infty)$

B. $\left(-\infty, -\frac{2\sqrt{3}}{3}\right)$

C. $\left(-\frac{2\sqrt{3}}{3}, \frac{2\sqrt{3}}{3}\right)$

D. $\left(\frac{2\sqrt{3}}{3}, \infty\right)$

ID: 4.3-21

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20. Using the derivative of f(x) given below, determine the intervals on which f(x) is increasing or decreasing.

$f'(x) = (4 - x)(6 - x)$

A. Decreasing on $(-\infty, 4)$; increasing on $(6, \infty)$

B. Decreasing on $(-\infty, 4) \cup (6, \infty)$; increasing on $(4, 6)$

C. Decreasing on $(4, 6)$; increasing on $(-\infty, 4) \cup (6, \infty)$

D. Decreasing on $(-\infty, -4) \cup (-6, \infty)$; increasing on $(-4, -6)$

ID: 4.3-4

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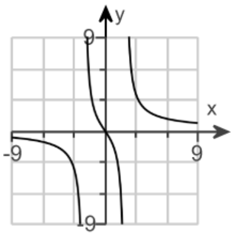
21. Graph the rational function shown below.

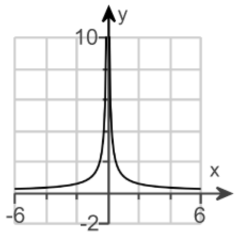
$$y = \frac{6}{x^2 + 4}$$

Choose the correct graph below.

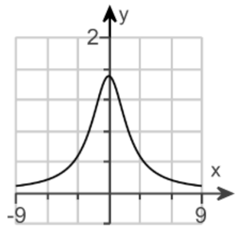
A.



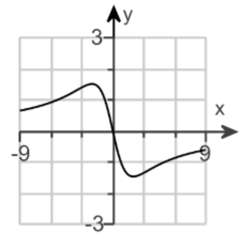
B.



C.



D.



ID: 4.4.101

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22. Find the extreme values of the function and where they occur.

$$y = \frac{1}{x^2 - 1}$$

- A. There are no extremes
- B. Local maximum at (1,0), local minimum at (− 1,0)
- C. Local maximum at (0, − 1)
- D. Local maximum at (− 1,0), local minimum at (1,0)

ID: 4.1-16

23. Find the absolute maximum and minimum values of the following function on the given interval. Then graph the function. Identify the points on the graph where the absolute extrema occur.

$$f(x) = -\frac{6}{x^2},\ 0.5 \le x \le 2$$

Find the absolute maximum. Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

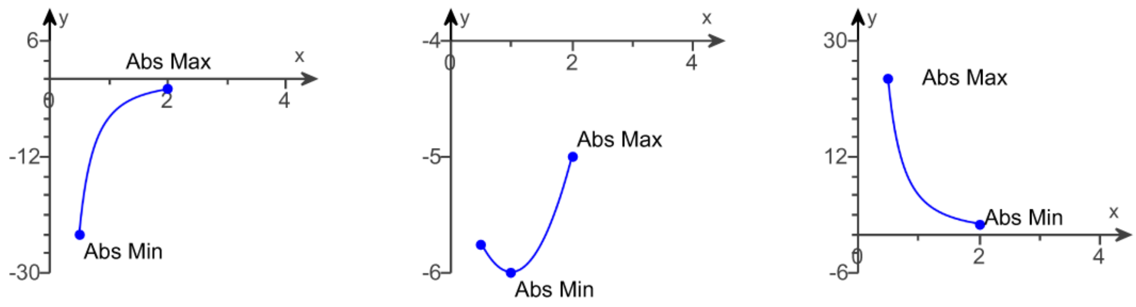
- A. The absolute maximum value __________ occurs at x = __________.
  (Use a comma to separate answers as needed.)
- B. There is no absolute maximum.

Find the absolute minimum. Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

- A. The absolute minimum value __________ occurs at x = __________.
  (Use a comma to separate answers as needed.)
- B. There is no absolute minimum.

Choose the correct graph of the function.

A. B. C.



ID: 4.1.25

24. Find the absolute maximum and minimum values of the following function on the given interval. Then graph the function.

$f(x) = x^2 - 9, \ -4 \le x \le 3$

Find the absolute maximum value. Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

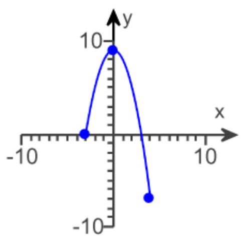
- A. The absolute maximum value ____________ occurs at $x =$ ____________.
  (Simplify your answers. Use a comma to separate answers as needed.)
- B. There is no absolute maximum.

Find the absolute minimum value. Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

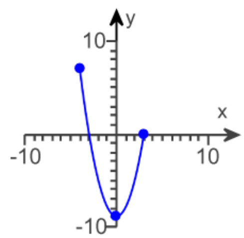
- A. The absolute minimum value ____________ occurs at $x =$ ____________.
  (Simplify your answers. Use a comma to separate answers as needed.)
- B. There is no absolute minimum.

Graph the function. Choose the correct answer below.

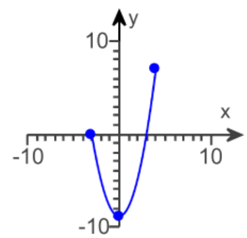
A.



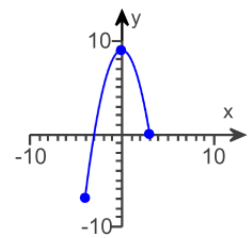
B.



C.



D.



ID: 4.1.23

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25. A driver driving along a highway at a steady 45 mph (66 ft/sec) sees an accident ahead and slams on the brakes. What constant deceleration is required to stop the car in 242 ft? To find out, carry out the following steps.

(1) Solve the following initial value problem.

$$\frac{d^2s}{dt^2} = -k \text{ (k constant), with } \frac{ds}{dt} = 66 \text{ and } s = 0 \text{ when } t = 0$$

(2) Find the value of t that makes $\frac{ds}{dt} = 0$. (The answer will involve k.)

(3) Find the value of k that makes $s = 242$ for the value of t found in the step (2).

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(1) $s =$ ____________

(2) $t =$ ____________, when $\frac{ds}{dt} = 0$

(3) When $s = 242$ for the value of t found in the step (2), $k =$ ____________.

ID: 4.8.121

26. Given the acceleration, initial velocity, and initial position of a body moving along a coordinate line at time t, find the body's position at time t.

$a = 9.8$, $v(0) = 3$, $s(0) = 7$

- A. $s = 4.9t^2 + 3t$
- B. $s = 4.9t^2 + 3t + 7$
- C. $s = -4.9t^2 - 3t + 7$
- D. $s = 9.8t^2 + 3t + 7$

ID: 4.8-32

27. Suppose a business can sell x gadgets for $p(x) = 250 - 0.01x$ dollars apiece, and it costs the business $c(x) = 1{,}000 + 25x$ dollars to produce the x gadgets. Determine the production level and price per gadget required to maximize profit.

- A. 111 gadgets at $248.89 each
- B. 11,250 gadgets at $137.50 each
- C. 13,750 gadgets at $112.50 each
- D. 10,000 gadgets at $150.00 each

ID: 4.6-10

1. D. $x = -1$

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2. C. absolute maximum is $-\frac{1}{9}$ at $x = 3$; absolute minimum is -4 at $x = \frac{1}{2}$

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3. A. The critical point(s) or domain endpoint(s) where f' is undefined is/are at $x =$ **1**.
(Type an integer or a simplified fraction. Use a comma to separate answers as needed.)

A. The critical point(s) where f' is 0 is/are at $x =$ $\mathbf{-\frac{9}{2}, \frac{3}{2}}$.

(Type an integer or a simplified fraction. Use a comma to separate answers as needed.)

A. The point(s) corresponding to the local maxima is/are $\mathbf{\left(-\frac{9}{2}, \frac{113}{4}\right), \left(\frac{3}{2}, -\frac{7}{4}\right)}$.

(Type an ordered pair. Simplify your answer. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

A. The point(s) corresponding to the local minima is/are **(1, −2)**.
(Type an ordered pair. Simplify your answer. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

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4. $-\frac{1}{2}$

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5. 1

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6. C. local maximum at $x = -2$; local minimum at $x = -4$

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7. B. $(3,\infty)$

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8. A. Maximum = 0 at $x = \frac{\pi}{2}$, minimum = $-\ln 2$ at $x = \frac{\pi}{6}$

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9. B. increasing on $(-2,2)$; decreasing on $(-6,-2)$ and $(2,6)$; absolute maximum at $(2,3)$; absolute minimum at $(-2,-3)$

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10. C. Local minimum at $x = 3$; local maximum at $x = -3$; concave up on $(0,\infty)$; concave down on $(-\infty,0)$

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11. $-\frac{69}{11}$

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12. $\frac{1}{10}$

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13. $\frac{1}{2}$

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14. A. 28 units

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15. B. $2t^3 + \frac{t^2}{14} + C$

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16. B. $\frac{2}{3}t^{\frac{3}{2}} - \frac{4}{5}t^{\frac{5}{4}} + C$

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17. D. $5\sin^{-1}x - 2\ln|x| + C$

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18. D. $y = 6x^3 + 5$

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19. C. $\left(-\frac{2\sqrt{3}}{3}, \frac{2\sqrt{3}}{3}\right)$

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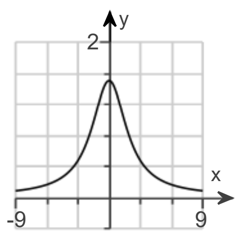
20. C. Decreasing on $(4, 6)$; increasing on $(-\infty, 4) \cup (6, \infty)$

21.



C.

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22. C. Local maximum at $(0, -1)$

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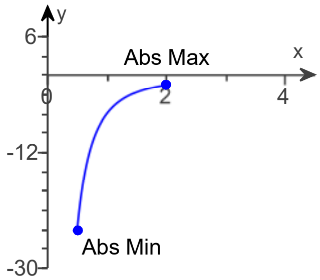
23. A. The absolute maximum value $-\frac{3}{2}$ occurs at x = **2** .

(Use a comma to separate answers as needed.)

A. The absolute minimum value **− 24** occurs at x = **0.5** .

(Use a comma to separate answers as needed.)



A.

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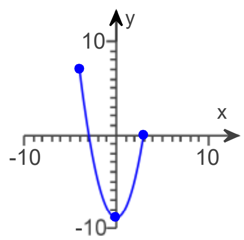
24. A. The absolute maximum value **7** occurs at x = **− 4** .

(Simplify your answers. Use a comma to separate answers as needed.)

A. The absolute minimum value **− 9** occurs at x = **0** .

(Simplify your answers. Use a comma to separate answers as needed.)



B.

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25. $\frac{-kt^2}{2} + 66t$

$\frac{66}{k}$

9

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26. B. $s = 4.9t^2 + 3t + 7$

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27. B. 11,250 gadgets at $137.50 each
