❌ 4.1.1                                                                    ☰ Question Help

Determine from the given graph whether the function has any absolute extreme values on [a, b]. Then explain how your answer is consistent with the extreme value theorem.



Determine whether the function has any absolute extreme values on [a, b]. Choose the correct answer below.

⭐ A. The function has an absolute maximum value at $x = c_2$ and an absolute minimum value at $x = b$ on [a, b].

❌ B. The function has an absolute minimum value $x = b$ but does not have an absolute maximum value on [a, b].

○ C. The function does not have any absolute extreme values on [a, b].

○ D. The function has an absolute maximum value at $x = c_1$ but does not have an absolute minimum value on [a, b].

Explain the results in terms of the extreme value theorem.
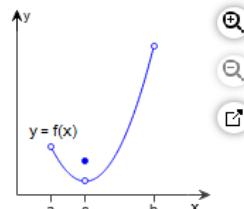
○ A. Since the function f is continuous and the domain of f is not a closed interval, f may or may not have any absolute extreme values on its domain.

✅ B. Since the function f is continuous on a closed interval, f attains both an absolute maximum value and an absolute minimum value on its domain.

○ C. Since the function f is not continuous and the domain of f is a closed interval, f may or may not have any absolute extreme values on its domain.

○ D. Since the function f is not continuous and the domain of f is not a closed interval, f may or may not attain any absolute extreme values on its domain.

I just copied my answer from HMK. Remember to verify the graphs!

✔ 4.1.4                                                                    ☰ Question Help

Determine from the given graph whether the function has any absolute extreme values on (a, b). Then explain how your answer is consistent with the extreme value theorem.



Determine whether the function has any absolute extreme values on (a, b). Choose the correct answer below.

○ A. The function has an absolute minimum at $x = c$ value but does not have an absolute maximum value on (a, b).

○ B. The function has an absolute maximum value at $x = a$ but does not have an absolute minimum value on (a, b).

○ C. The function has an absolute maximum value at $x = a$ and an absolute minimum value at $x = c$ on (a, b).

✅ D. The function does not have any absolute extreme values on its domain.

Explain the results in terms of the extreme value theorem.

○ A. Since the function f is continuous on a closed interval, f attains both an absolute maximum value and an absolute minimum value on its domain.

○ B. Since the function f is continuous and the domain of f is not a closed interval, f may or may not have any absolute extreme values on its domain.

○ C. Since the function f is not continuous and the domain of f is a closed interval, f may or may not have any absolute extreme values on its domain.

✅ D. Since the function f is not continuous and the domain of f is not a closed interval, f may or may not attain any absolute extreme values on its domain.
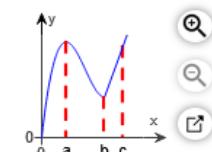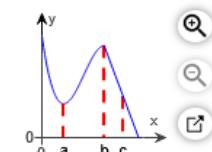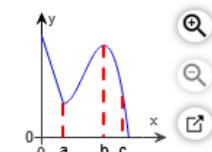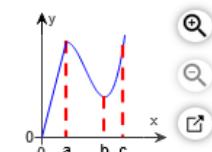
✓ 4.1.11     ☰ Question Help

Find the graph given the following table.

| x | f'(x) |
|---|-------|
| a | 0 |
| b | does not exist |
| c | −7 |

Choose the correct graph below.
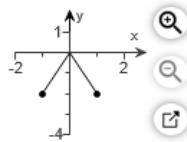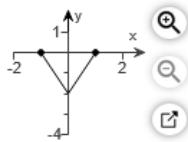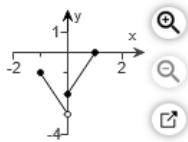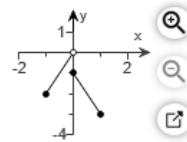
○ A.



● B.



○ C.



○ D.

✓ 4.1.17     ☰ Question Help

Sketch the graph of the following function and determine whether the function has any absolute extreme values on its domain. Explain how your answ is consistent with the extreme value theorem.

$$g(x) = \begin{cases} 2x, & -1 \le x < 0 \\ -2x - 1, & 0 \le x \le 1 \end{cases}$$

Sketch the graph of the function g(x). Choose the correct graph below.

○ A.



○ B.



○ C.



● D.



Determine whether the function has any absolute extreme values on its domain. Choose the correct answer below.

○ A. The function has an absolute maximum value at x = 0 and an absolute minimum at x = 1 on its domain.

● B. The function has an absolute minimum at x = 1 value but does not have an absolute maximum value on its domain.

○ C. The function has an absolute maximum value at x = 0 but does not have an absolute minimum value on its domain.

○ D. The function does not have any absolute extreme values on its domain.

Explain the results in terms of the extreme value theorem.

○ A. Since the function g is continuous on an open interval, it may or may not have any absolute extreme values on its domain.

○ B. Since the function g is continuous on a closed interval, it attains both an absolute maximum value and an absolute minimum value on its domain.

● C. Since the function g is not continuous on a closed interval, it may or may not have any absolute extreme values on its domain.

○ D. Since the function g is not continuous on an open interval, it does not attain any absolute extreme values on its domain.

Question is complete

✔ 4.1.21                                                                    ☰ C

Find the absolute maximum and minimum values of the function on the given interval.

$f(x) = \frac{2}{7}x - 5,$     $-9 \le x \le -5$

The absolute maximum of the function $f(x) = \frac{2}{7}x - 5$ on the interval $-9 \le x \le -5$ has a value of $\boxed{-\frac{45}{7}}$.

(Type a simplified fraction.)

The absolute minimum of the function $f(x) = \frac{2}{7}x - 5$ on the interval $-9 \le x \le -5$ has a value of $\boxed{-\frac{53}{7}}$.

(Type a simplified fraction.)

---

✖ 4.1.23                                                          ☰ Question Help

Find the absolute maximum and minimum values of the function on the given interval.

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

The absolute maximum of the function $f(x) = -x^2 + 9$ on the interval $-3 \le x \le 4$ has a value of $\boxed{9}$.
(Simplify your answer.)

The absolute minimum of the function $f(x) = -x^2 + 9$ on the interval $-3 \le x \le 4$ has a value of $\boxed{-7}$.
(Simplify your answer.)

**I answered 0 for that one. I don't understand this at all...**

---

✔ 4.1.41

Determine all critical points for the following function.

$f(x) = x^2 - 4x + 3$

$x = \boxed{2}$  (Use a comma to separate answers as needed.)

❌ **4.2.1**    ☰ Question Hel

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

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

The value(s) of c that satisfy the equation $\dfrac{f(b)-f(a)}{b-a}=f\,'(c)$ is/are $-2$ .

(Type a simplified fraction. Use a comma to separate answers as

You answered: 2

Get answer feedback

**Make sure you verify values. You probably forgot to carry over the negative.**

✔ **4.2.3**    Previous Question    ☰ Question Help

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

$f(x)=7x+\dfrac{7}{x},\ \left[\dfrac{1}{19},19\right]$

c = 1  (Use a comma to separate answers as needed.)

✔ **4.2.19**    ☰ Question Help

Show that the function $f(x)=x^4+8x+6$ has exactly one zero in the interval $[-1,0]$.

Which theorem can be used to determine whether a function f(x) has any zeros in a given interval?

✅ A. Intermediate value theorem
○ B. Rolle's Theorem
○ C. Mean value theorem
○ D. Extreme value theorem

To apply this theorem, evaluate the function $f(x)=x^4+8x+6$ at each endpoint of the interval $[-1,0]$.

f(−1) = −1  (Simplify your answer.)
f(0) = 6  (Simplify your answer.)

According to the intermediate value theorem, $f(x)=x^4+8x+6$ has  at least one zero  in the given interval.

Now, determine whether there can be more than one zero in the given interval.

Rolle's Theorem states that for a function f(x) that is continuous at every point over the closed interval [a,b] and differentiable at every point of its interior (a,b), if f(a)=f(b), then there is at least one number c in (a,b) at which f'(c)=0.

Find the derivative of $f(x)=x^4+8x+6$.

f'(x) = $4x^3+8$

Can the derivative of f(x) be zero in the interval $[-1,0]$?

○ Yes
✅ No

The function $f(x) = x^4 + 8x + 6$ has at least one zero at some point $x = a$ in the interval $[-1, 0]$. According to Rolle's Theorem, can there be another point $x = b$ in this interval where $f(a) = f(b) = 0$?

☑ No

○ Yes

Thus, since the intermediate value theorem shows that $f(x) = x^4 + 8x + 6$ has at least one zero in the interval $[-1, 0]$ and Rolle's Theorem shows that there cannot be two points $x = a$ and $x = b$ for which $f(a) = f(b)$ in this interval, the function $f(x)$ has exactly one zero in the interval $[-1, 0]$.

Question is complete

✔ 4.2.41

Given the velocity $v = \dfrac{ds}{dt}$ and the initial position of a body moving along a coordinate line, find the body's position at time t.

$v = 9.8t + 8$, $s(0) = 18$

$s(t) = 4.9t^2 + 8t + 18$

✔ 4.2.47                                        ≣ Question H

Given the acceleration $a = \dfrac{d^2 s}{dt^2}$, initial velocity, and initial position of a body moving on a coordinate line, find the body's position at time t.

$a = -4 \sin 2t$, $v(0) = 2$, $s(0) = -5$

$s(t) = \sin(2t) - 5$
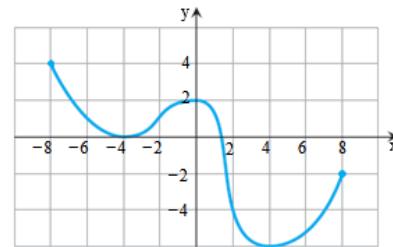
✔ 4.3.15    ☰ Question Help    ⚙

(a) Find the open intervals on which the function shown in the graph is increasing and decreasing.

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



(a) On what open interval(s), if any, is the function increasing? Select the correct choice below and fill in any answer boxes within your choice.

☑ A. The function is increasing on the open interval(s)  $(-4,0),(4,8)$ .
(Type your answer in interval notation. Use a comma to separate answers as needed.)

○ B. The function is never increasing.

On what open interval(s), if any, is the function decreasing? Select the correct choice below and fill in any answer boxes within your choice.

☑ A. The function is decreasing on the open interval(s)  $(-8,-4),(0,4)$ .
(Type your answer in interval notation. Use a comma to separate answers as needed.)

○ B. The function is never decreasing.

(b) If the function has an absolute maximum, where does it occur? Select the correct choice below and fill in any answer boxes within your choice.

☑ A. An absolute maximum occurs at the point(s)  $(-8,4)$ .
(Type an ordered pair. Use a comma to separate answers as needed.)

○ B. The function has no absolute maximum.

If the function has other local maxima, where do they occur? Since a list of local maxima automatically includes the absolute maximum, do not include the absolute maximum in the list of local maxima. Select the correct choice below and fill in any answer boxes within your choice.

☑ A. A local maximum occurs at the point(s)  $(0,2),(8,-2)$ .
(Type an ordered pair. Use a comma to separate answers as needed.)

○ B. The function has no local maximum that is not an absolute maximum.

If the function has an absolute minimum, where does it occur? Select the correct choice below and fill in any answer boxes within your choice.

☑ A. An absolute minimum occurs at the point(s)  $(4,-6)$ .
(Type an ordered pair. Use a comma to separate answers as needed.)

○ B. The function has no absolute minimum.

If the function has other local minima, where do they occur? Since a list of local minima automatically includes the absolute minimum, do not include the absolute minimum in the list of local minima. Select the correct choice below and fill in any answer boxes within your choice.
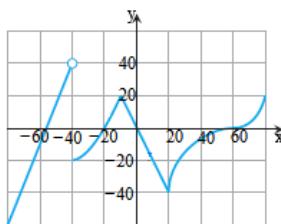
☑ A. A local minimum occurs at the point(s)  $(-4,0)$ .
(Type an ordered pair. Use a comma to separate answers as needed.)

○ B. The function has no local minimum that is not an absolute minimum.

✔ 4.3.17
☰ Question Help

**(a)** Find the open intervals on which the function shown in the graph is increasing and decreasing.
**(b)** Identify the function's local and absolute extreme values, if any, saying where they occur.



**(a)** On what open intervals is f increasing? Choose the correct answer below.

✔ A. (− 80, − 40), (− 40, − 10), and (20,80)
○ B. (20,80) and (− 10,20)
○ C. (− 10,20)
○ D. (− 80, − 40), (− 40, − 10), and (− 10,20)

On what open intervals is f decreasing? Choose the correct answer below.

○ A. (20,80) and (− 10,20)
✔ B. (− 10,20)
○ C. (− 40, − 10), and (− 10,20)
○ D. (− 80, − 40), (− 40, − 10), and (20,80)

**(b)** At which points do the function's absolute maximum and local maximum values occur? Choose the correct answer below.

○ A. Absolute maximum at (− 80, − 60), other local maxima at (− 10,20) and (20, − 40)
○ B. Absolute maximum at (− 80, − 60), other local maxima at (− 40, − 20) and (20, − 40)
✔ C. No absolute maximum, local maxima at (− 10,20) and (80,20)
○ D. No absolute maximum, local maxima at (− 40, − 20) and (20, − 40)

At which points do the function's absolute minimum and local minimum values occur? Choose the correct answer below.

○ A. No absolute minimum, local minima at (− 40, − 20) and (80,20)
○ B. No absolute minimum, local minima at (− 10,20) and (80,20)
✔ C. Absolute minimum at (− 80, − 60), other local minima at (− 40, − 20) and (20, − 40)
○ D. Absolute minimum at (− 80, − 60), other local minima at (− 10,20) and (80,20)

✓ 4.3.21                                                                    ☰ Question Help

(a) Find the open intervals on which the function $h(x) = x^3 + 2x^2$ is increasing and decreasing.
(b) Identify the function's local and absolute extreme values, if any, saying where they occur.

(a) On what open interval(s), if any, is the function increasing? Select the correct choice below and fill in any answer boxes within your choice.

☑ A. $\left(-\infty, -\dfrac{4}{3}\right),(0,\infty)$

(Type your answer in interval notation. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

○ B. The function is never increasing.

On what open interval(s), if any, is the function decreasing? Select the correct choice below and fill in any answer boxes within your choice.

☑ A. $\left(-\dfrac{4}{3},0\right)$

(Type your answer in interval notation. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

○ B. The function is never decreasing.

(b) What are the function's absolute maximum and local maximum, and where do they occur? Select the correct choice below and fill in any answer boxes within your choice.
(Use a comma to separate answers as needed. Type an integer or a simplifed fraction.)

☑ A. There is no absolute maximum. The local maximum is $\dfrac{32}{27}$ and occurs at $x = -\dfrac{4}{3}$.

○ B. The absolute and local maximum are both $\dfrac{32}{27}$ and occur at $x = \boxed{\phantom{x}}$.

○ C. The absolute and local maximum are both 0 and occur at $x = \boxed{\phantom{x}}$.

○ D. There is no absolute maximum and no local maximum.

What are the function's absolute minimum and local minimum, and where do they occur? Select the correct choice below and fill in any answer boxes within your choice.
(Use a comma to separate answers as needed. Type an integer or a simplifed fraction.)

○ A. The absolute and local minimum are both 0 and occur at $x = \boxed{\phantom{x}}$.

○ B. The absolute and local minimum are both $-\dfrac{4}{3}$ and occur at $x = \boxed{\phantom{x}}$.

☑ C. There is no absolute minimum. The local minimum is 0 and occurs at $x = \boxed{0}$.

○ D. There is no absolute minimum and no local minimum.

❌ 4.3.23         ☰ Question Help

(a) Find the open intervals on which the function $f(\theta) = \theta^2 + 2\theta^3$ is increasing and decreasing.
(b) Identify the function's local and absolute extreme values, if any, saying where they occur.

(a) On what open interval(s), if any, is the function increasing? Select the correct choice below and fill in any answer boxes within your choice.

⦿ A.   $\left(-\infty, -\frac{1}{3}\right), (0, \infty)$

(Type your answer in interval notation. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as

○ B.   You answered: $\left(-\infty, -\frac{1}{3}\right)$

On what open interval(s), if any, is the function decreasing? Select the correct choice below and fill in any answer boxes within your choice.

✅ A.   $\left(-\frac{1}{3}, 0\right)$

(Type your answer in interval notation. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

○ B. The function is never decreasing.

(b) What are the function's absolute maximum and local maximum, and where do they occur? Select the correct choice below and fill in any answer boxes within your choice.
(Use a comma to separate answers as needed. Type an integer or a simplified fraction.)

○ A. The absolute and local maximum are both 0 and occur at x = ▢ .

❌ B. The absolute and local maximum are both $\frac{1}{27}$ and occur at x = ▢ .

✅ C. There is no absolute maximum. The local maximum is $\frac{1}{27}$ and occurs at x = $-\frac{1}{3}$ .

○ D. There is no absolute maximum and no local maximum.

**Don't understand the first one still...fuck it...**

**The other one I should've known because there weren't any absolute extrema.**

What are the function's absolute minimum and local minimum, and where do they occur? Select the correct choice below and fill in any answer boxes within your choice.
(Use a comma to separate answers as needed. Type an integer or a simplified fraction.)

○ A. The absolute and local minimum are both $-\frac{1}{3}$ and occur at x = ▢ .

○ B. The absolute and local minimum are both 0 and occur at x = ▢ .

✅ C. There is no absolute minimum. The local minimum is 0 and occurs at x = 0 .

○ D. There is no absolute minimum and no local minimum.

✔ 4.3.41

For the function $f(x) = 5x + 4x^2$ on the interval $-\infty < x \le 1$, identify the function's local extreme values in the given domain, and say where they are assumed. Which of the extreme values, if any, are absolute?

Choose the correct answer regarding local extreme values.

○ A. f has no local extrema.

○ B.
   f has a local minimum at $x = -\dfrac{5}{8}$ but no local maximum.

○ C.
   f has a local maximum at $x = -\dfrac{5}{8}$ but no local minimum.

◉ D.
   f has a local minimum at $x = -\dfrac{5}{8}$ and a local maximum at $x = 1$.

Choose the correct answer regarding absolute extreme values.

○ A. The function has no absolute extrema.

◉ B.
   The function has an absolute minimum at $x = -\dfrac{5}{8}$ but no absolute maximum.

○ C.
   The function has an absolute maximum at $x = -\dfrac{5}{8}$ but no absolute minimum.

○ D.
   The function has a local minimum at $x = -\dfrac{5}{8}$ and a local minimum at $x = 1$.

✔ 4.4.1
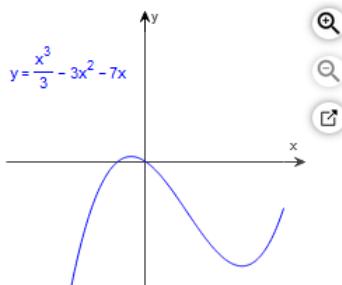
Identify the inflection points and local maxima and minima of the function graphed below. Identify the intervals on which it is concave up and concave down.



The curve $y = \dfrac{x^3}{3} - 3x^2 - 7x$ has a point of inflection at $(3, -39)$.

(Type an ordered pair. Type a simplified fraction.)

Choose the correct answer regarding local maxima and minima.

○ A.
   Local maximum: $-\dfrac{245}{3}$ at $x = 7$

   Local minimum: $\dfrac{11}{3}$ at $x = -1$

◉ B.
   Local maximum: $\dfrac{11}{3}$ at $x = -1$

   Local minimum: $-\dfrac{245}{3}$ at $x = 7$

○ C. No local maxima or minima

○ D. Local minima: $-39$ at $x = 3$

Choose the correct answer regarding concavity.

○ A. Concave up on $(-\infty, 3)$
   Concave down on $(3, \infty)$

◉ B. Concave down on $(-\infty, 3)$
   Concave up on $(3, \infty)$

○ C. Concave down on $(-\infty, \infty)$

○ D. Concave up on $(-\infty, \infty)$

✔ 4.4.9     ≣ Question Help

Find the coordinates of any local extreme points and inflection points. Use these to graph the function $y = x^2 - 4x + 3$.

Choose the correct answer regarding local extreme points.
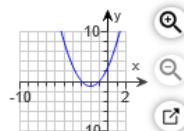
✔ A. The function has a local minimum at $(2, -1)$.

○ B. The function has a local maximum at $(2, -1)$.

○ C. The function has no local extreme points.

Choose the correct answer regarding inflection points.
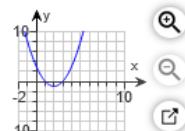
○ A. The function has an inflection point at $(0,3)$.

○ B. The function has inflection points at $(1,0)$ and $(3,0)$.

○ C. The function has an inflection point at $(2, -1)$.

✔ D. The function has no inflection points.

Choose the correct graph of $y = x^2 - 4x + 3$.

○ A.



● B.



○ C.



○ D.
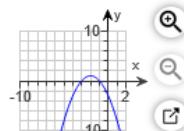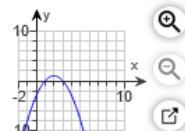
✖ 4.4.17     ≣ Question Help

Find and graph the coordinates of any local extreme points and inflection points of the function $y = x^4 - 6x^2$.

Choose the correct answer regarding local extreme points.
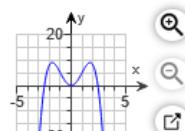
○ A. No local extreme points

● B. Local minimum: $\left(-\sqrt{3}, -9\right)$, $\left(\sqrt{3}, -9\right)$
Local maximum: $(0,0)$

○ C. Local maximum: $\left(-\sqrt{3}, -9\right)$, $\left(\sqrt{3}, -9\right)$
Local minimum: $(0,0)$

Choose the correct answer regarding inflection points.
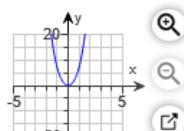
★ A. Inflection points: $(-1, -5), (1, -5)$

✖ B. Inflection points: $\left(-\sqrt{3}, -9\right)$, $\left(\sqrt{3}, -9\right)$

○ C. No inflection points

Choose the correct graph of $y = x^4 - 6x^2$.

○ A.



○ B.



○ C.



● D.
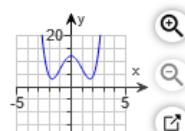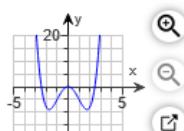
**✗ 4.4.23**          ▤ Question Help

Find the coordinates of any local extreme points and inflection points. Use these to graph the function $y = x - \sin(-x)$ on the interval $0 \le x \le 2\pi$.

Choose the correct answer regarding local extreme points.
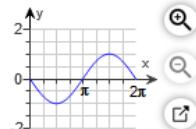
○ A.  The function as no local extreme points.

○ B.  The function has a local maximum at $(\pi, \pi)$.

◉ C.  Local minimum: $(0,0)$
      Local maximum: $(2\pi, 2\pi)$

○ D.  Local maximum: $(0,0)$
      Local minimum: $(2\pi, 2\pi)$

Choose the correct answer regarding inflection points.
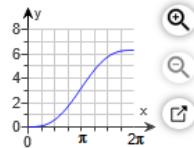
○ A.  The function has no inflection points.

◉ B.  The function has an inflection point at $(\pi, \pi)$.

○ C.  The function has an inflection point at $(0,0)$ and $(2\pi, 2\pi)$.

Choose the correct graph of $y = x - \sin(-x)$.

○ A.          ✗ B.

○ C.          ○ D.
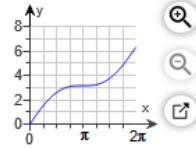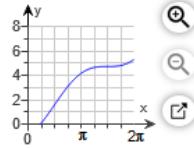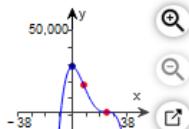
**✔ 4.4.51**          ▤ Question Help

The first derivative of a continuous function $y = f(x)$ is $y' = x(x - 24)^2$. Find $y''$ and then use the graphing procedure to sketch the general shape of the graph of f.
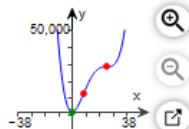
$y'' = 3x^2 - 96x + 576$

Choose the correct graph below.
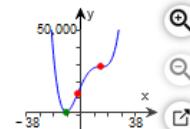
○ A.          ◉ B.          ○ C.          ○ D.
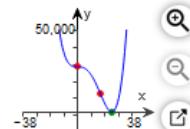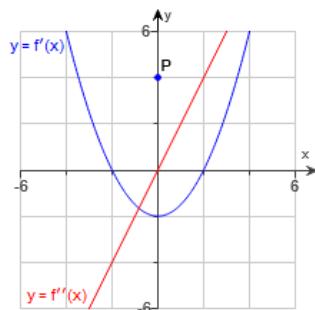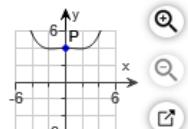
**✔ 4.4.71**          ▤ Question Help

The given figure shows the graphs of the first and second derivatives of a function $y = f(x)$. Sketch the approximate graph of f, given that the graph passes through the point P.
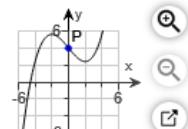
Which of the following is the correct graph of the function $y = f(x)$?

○ A.          ◉ B.

○ C.          ○ D.

✔ 4.4.75
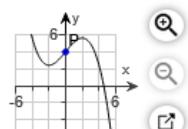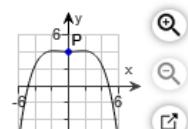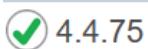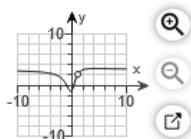
Graph the following rational function.
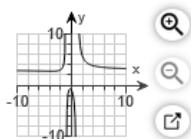
$$y = \frac{3x^2 + 2x - 1}{x^2 - 1}$$

Choose the correct graph below.

○ A.

○ B.

○ C.

☑ D.

---

✖ 4.5.7
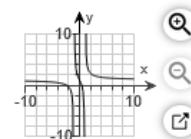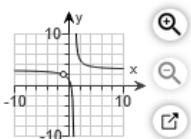
A rectangular plot of farmland will be bounded on one side by a river and on the other three sides by a single-strand electric fence. With 2400 m of wire at your disposal, what is the largest area you can enclose, and what are its dimensions?

The maximum area of the rectangular plot is  720000  m².

The length of the shorter side of the rectangular plot is  600  m.
The length of the longer side of the rectangular plot is  1200  m.

**I must've misread the graph or something.**

---

✔ 4.5.9

A rectangular tank that is 256 ft³ with a square base and open top is to be constructed of sheet steel of a given thickness. Find the dimensions of the tank with minimum weight.

The dimensions of the tank with minimum weight are  8,8,4  ft.
(Simplify your answer. Use a comma to separate answers.)
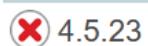
**Basically when you figure out S, just do it two times and then one of half the value.**

---

✖ 4.5.23

A silo (base not included) is to be constructed in the form of a cylinder surmounted by a hemisphere. The cost of construction per square unit of surface area is 2 times as great for the hemisphere as it is for the cylindrical sidewall. Determine the dimensions to be used if the volume is fixed at 8000 cubic units and the cost of construction is to be kept to a minimum. Neglect the thickness of the silo and waste in construction.

The radius of the cylindrical base (and of the hemisphere) is  9.8  ft.
(Round to the nearest tenth as needed.)

The height of the cylindrical base is  19.7  ft.
(Round to the nearest tenth.)

⊗ 4.5.37         ☰ Question Help   ⚙

The height (feet) of an object moving vertically is given by $s = -16t^2 + 272t + 204$, where t is in seconds. Find the object's velocity at t = 6, its maximum height and when it occurs, and its velocity when s = 0.

The velocity of the object at t = 6 seconds is  80  ft/second.
(Simplify your answer. Type an integer or a decimal.)

The maximum height occurs at t =  8.5  seconds.
(Simplify your answer. Type an integer or a decimal.)

The maximum height is  1360  feet.
(Simplify your answer. Type an integer or a decimal.)

The velocity when s = 0 is  −295.04  feet/second.
(Round to the nearest hundr~~ed~~ ⌐

           You answered:   −246.72
           Correct answers:   −295.04 ± 0.01
                        −295.03 ± 0.01

           Get answer feedback

**I was so spent at this point**
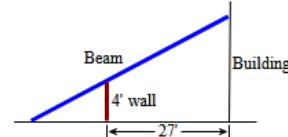
✖ 4.5.39         ☰ Question Help   ⚙

The 4-ft wall shown here stands 27 ft from the building. Find the length of the shortest straight beam that will reach to the side of the building from the ground outside the wall.



The length of the shortest beam is  39.1  ft.
(Round to the nearest tenth as needed.)

✔ 4.7.1         ☰ Question Help   ⚙

Find the antiderivative for each function when C equals 0. Do as many as you can mentally. Check your answers by differentiation.

    **a.** $2x$      **b.** $x^{12}$     **c.** $x^2 + 8x + 7$

**a.** The antiderivative of $2x$ is  $x^2$ .

**b.** The antiderivative of $x^{12}$ is  $\dfrac{x^{13}}{13}$ .

**c.** The antiderivative of $x^2 + 8x + 7$ is  $\dfrac{x^3}{3} + 4x^2 + 7x$ .

❌ 4.7.5

Find the antiderivative for each function when C equals 0. Check your answers by differentiation.

(a) $g(x) = \dfrac{1}{x^3}$     (b) $h(x) = \dfrac{7}{x^3}$     (c) $k(x) = 3 - \dfrac{7}{x^3}$

(a) $G(x) = -\dfrac{1}{2x^2}$

(b) $H(x) = -\dfrac{7}{2x^2}$

(c) $K(x) = 3x + \dfrac{7}{2x^2}$

You answered: $3x - \dfrac{7}{2x^2}$

Get answer feedback

This is wrong. My answer was right.

✔ 4.7.11

Find the antiderivative of the function $f(x) = -8 \sin (8x)$ when $C = 0$.

The antiderivative is $\cos (8x)$ .

✔ 4.7.17

Find the indefinite integral $\displaystyle\int (6x + 7)dx$.

$\displaystyle\int (6x + 7)dx = 3x^2 + 7x + c$
(Use C as an arbitrary constant.)

✔ 4.7.19

Find the most general antiderivative or indefinite integral. Check your answer by differentiation.

$$\int \left( 5t^4 + \frac{t}{5} \right) dt$$

$$\int \left( 5t^4 + \frac{t}{5} \right) dt = t^5 + \frac{t^2}{10} + c$$

(Use C as the arbitrary constant.)

✔ 4.7.23

Find the indefinite integral $\int \left( \frac{1}{x^{14}} - x^{14} - \frac{1}{3} \right) dx$.

$$\int \left( \frac{1}{x^{14}} - x^{14} - \frac{1}{3} \right) dx = -\frac{1}{13x^{13}} - \frac{x^{15}}{15} - \frac{1}{3}x + c$$

(Use C as an arbitrary constant.)

✖ 4.7.29

Find the most general antiderivative or indefinite integral. Check your answers by differentiation.

$$\int \left( 20y^3 - \frac{5}{y^{1/3}} \right) dy$$

$$\int \left( 20y^3 - \frac{5}{y^{1/3}} \right) dy = 5y^4 - \frac{15}{2}y^{\frac{2}{3}} + C \quad \text{(Use C as the arbitrary constant.)}$$

You answered: $5y^4 - \frac{15}{2}y^{\frac{2}{3}}$

Get answer feedback

Forgot + C

✔ 4.7.35

Find the indefinite integral $\int 9 \cos t\, dt$.

$\int 9 \cos t\, dt = \boxed{9 \sin t + c}$

(Use C as an arbitrary constant.)

✔ 4.7.37

Find the most general antiderivative or indefinite integral. Check your answer by differentiation.

$$\int 5 \sin \frac{\theta}{6}\, d\theta$$

$\int 5 \sin \frac{\theta}{6}\, d\theta = \boxed{-30 \cos \left( \frac{\theta}{6} \right) + c}$

(Use C as the arbitrary constant.)

✔ 4.7.41

Find the indefinite integral $\int -\frac{\csc \theta \cot \theta}{2}\, d\theta$.

$\int -\frac{\csc \theta \cot \theta}{2}\, d\theta = \boxed{\frac{\csc \theta}{2}} + c$

(Use C as an arbitrary constant.)

✓ 4.7.71

Find the function y(x) satisfying $\frac{dy}{dx} = 6x - 5$ and y(3) = 0.

___

The function y(x) satisfying $\frac{dy}{dx} = 6x - 5$ and y(3) = 0 is y(x) = $3x^2 - 5x - 12$ .

✓ 4.7.75

Find the function y(x) satisfying $\frac{dy}{dx} = 4x^{-8/9}$ and y(-1) = -9.

___

The function y(x) satisfying $\frac{dy}{dx} = 4x^{-8/9}$ and y(-1) = -9 is y(x) = $36x^{\frac{1}{9}} + 27$ .

✓ 4.7.81

For the following function f, find the antiderivative F that satisfies the given condition.

$f(v) = \frac{1}{5} \sec v \tan v$, F(0) = 2

___

$F(v) = \frac{1}{5} \sec v + \frac{9}{5}$

✓ 4.7.83

Find the function y(x) satisfying $\frac{d^2 y}{dx^2} = 12 - 30x$, y'(0) = 7, and y(0) = 2.

___

The function satisfying $\frac{d^2 y}{dx^2} = 12 - 30x$, y'(0) = 7, and y(0) = 2 is y(x) = $-5x^3 + 6x^2 + 7x + 2$ .

✓ 4.7.87
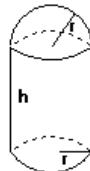
Find the function y(x) satisfying $\dfrac{d^3y}{dx^3} = 12$, $y''(0) = 16$, $y'(0) = 3$, and $y(0) = 6$.

---

The function y(x) satisfying $\dfrac{d^3y}{dx^3} = 12$, $y''(0) = 16$, $y'(0) = 3$, and $y(0) = 6$ is $2x^3 + 8x^2 + 3x + 6$ .

A silo (base not included is to be constructed in the form of a cylinder surmounted by a hemisphere. The cost of construction per square unit of surface area is 2 times as great for the hemisphere as it is for the cylindrical sidewall. Determine the dimensions to be used if the volume is fixed at 2000 cubic units and the cost of construction is to be kept to a minimum. Neglect the thickness of the silo and waste in construction.

The area, A, of the structure is the area of the hemisphers, $A_H$, plus the area of the cylinder, $A_C$.



$A = A_H + A_C = 2\pi r^2 + 2\pi rh$.

If the cost of the base is one unit per square foot and the cost of the hemisphere is 2 units per square foot, the cost, C, of the structure is

$C = (2)2\pi r^2 + 2\pi rh$.

The volume of the structure is $2000 = \dfrac{2}{3}\pi r^3 + \pi r^2 h$.

Solve the volume equation for h.

$h = \dfrac{2000}{\pi r^2} - \dfrac{2r}{3}$

Substitute the expression for h into the cost function and simplify.

$C = \dfrac{4000}{r} + \dfrac{8\pi r^2}{3}$

To optimize the cost, find the derivative of C.

$\dfrac{dC}{dr} = -\dfrac{4000}{r^2} + \dfrac{16\pi r}{3}$

Set $\dfrac{dC}{dr}$ equal to 0, and solve for r.

$-\dfrac{4000}{r^2} + \dfrac{16\pi r}{3} = 0$

$r = 6.2$ ft (rounded to the nearest tenth)

The second derivative of the cost function, $C = \dfrac{4000}{r} + \dfrac{8\pi r^2}{3}$, is $\dfrac{8000}{r^3} + \dfrac{16\pi}{3}$. Its sign over the domain of r is positive.

Since the second derivative of the cost function is positive over the domain of r, the cost function has a minimum at $r = 6.2$.
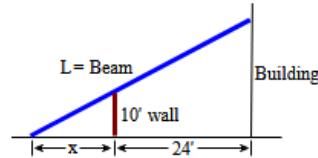
Substitute the value of r and V into h and simplify.

$h = \dfrac{2000}{\pi r^2} - \dfrac{2r}{3}$

$h = 12.4$ ft          (rounded to the nearest tenth)

Thus, a radius of 6.2 ft and a height of 12.4 ft will minimize cost for the construction of the silo.

The 10-ft wall shown here stands 24 ft from the building. Find the length of the shortest straight beam that will reach to the side of the building from the ground outside the wall.



Note that the given values are shown on the figure. The unknown quantity to be optimized is the length of the straight beam that will reach to the side of the building from the ground outside the wall, as shown in the figure.

Let the length of the beam be equal to L and let the base of the small triangle be x, as shown above. To find the length of the shortest straight beam, minimize L.

Express the length of the beam as a function of a single variable. To do so, use the fact that the small triangle and the large triangle are similar. First, write an expression for the hypotenuse of the small triangle in terms of the other sides of the triangle using the Pythagorean theorem.

$$\sqrt{x^2 + 100}$$

By similar triangles, $\dfrac{L}{\sqrt{x^2 + 100}} = \dfrac{x + 24}{x}$.

Simplifying the right side gives $\dfrac{L}{\sqrt{x^2 + 100}} = 1 + \dfrac{24}{x}$.

Solving for L gives $L = \left(1 + \dfrac{24}{x}\right)\sqrt{x^2 + 100}$, $x > 0$.

Since L is differentiable on $x > 0$, an interval with no endpoints, it can have a minimum value only where its first derivative is zero. Find the first derivative.

$$\frac{dL}{dx} = \left(1 + \frac{24}{x}\right)\frac{x}{\sqrt{x^2 + 100}} - \frac{24}{x^2}\sqrt{x^2 + 100}$$

Simplify the first derivative.

$$\left(1 + \frac{24}{x}\right)\frac{x}{\sqrt{x^2 + 100}} - \frac{24}{x^2}\sqrt{x^2 + 100} = \frac{x + 24}{\sqrt{x^2 + 100}} - \frac{24\sqrt{x^2 + 100}}{x^2}$$

$$= \frac{x^3 + 24x^2 - 24\left(x^2 + 100\right)}{x^2\sqrt{x^2 + 100}}$$

$$= \frac{x^3 - 2400}{x^2\sqrt{x^2 + 100}}$$

Set the first derivative equal to 0 and solve for x.

$$\frac{x^3 - 2400}{x^2\sqrt{x^2 + 100}} = 0$$

$$x^3 - 2400 = 0$$

$$x = 13.389$$

To find L, substitute x = 13.389 into the equation for L.

$$L = \left(1 + \frac{24}{x}\right)\sqrt{x^2 + 100}$$

$$= \left(1 + \frac{24}{13.389}\right)\sqrt{13.389^2 + 100}$$

$$= 46.7$$

Observe that the denominator of $\dfrac{dL}{dx} = \dfrac{x^3 - 2400}{x^2\sqrt{x^2 + 100}}$ is positive. The numerator is negative if $x < \sqrt{2400}$ and positive if $x > \sqrt{2400}$.

Therefore, $x = \sqrt{2400} = 13.389$ yields a minimum value for L.

Thus, you have found the minimum value for L and the length of the shortest beam is 46.7 ft.