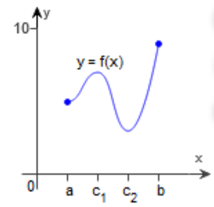
4.1.1

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 $x = b$ and an absolute minimum value at $x = c_2$ on [a, b].
- B. The function has an absolute maximum value at $x = c_1$ but does not have an absolute minimum value on [a, b].
- C. The function does not have any absolute extreme values on [a, b].
- D. The function has an absolute minimum value $x = c_2$ but does not have an absolute maximum 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 not continuous and the domain of f is a closed interval, f may or may not have any absolute extreme values on its domain.
- C. 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.
- 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

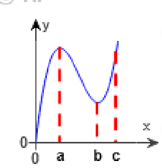
Question Help

Find the graph given the following table.

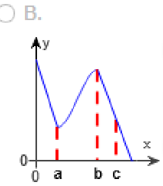
x	f′(x)
a	0
b	0
c	5

Choose the correct graph below.

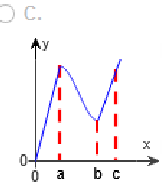
A.



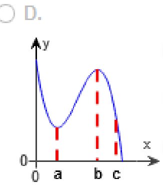
B.



C.



D.



Score: 10 of 10 pts

3 of 24

4.1.21

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

$f(x) = \frac{2}{3}x + 5, \quad 5 \le x \le 7$

The absolute maximum of the function $f(x) = \frac{2}{3}x + 5$ on the interval $5 \le x \le 7$ has a value of $\frac{29}{3}$.

(Type a simplified fraction.)

The absolute minimum of the function $f(x) = \frac{2}{3}x + 5$ on the interval $5 \le x \le 7$ has a value of $\frac{25}{3}$.

(Type a simplified fraction.)

Score: 10 of 10 pts

4 of 24

4.1.23

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

$f(x) = -x^2 + 1, \quad -1 \le x \le 2$

The absolute maximum of the function $f(x) = -x^2 + 1$ on the interval $-1 \le x \le 2$ has a value of 1.
(Simplify your answer.)

The absolute minimum of the function $f(x) = -x^2 + 1$ on the interval $-1 \le x \le 2$ has a value of -3.
(Simplify your answer.)

Score: 10 of 10 pts

5 of 24

4.1.41

Determine all critical points for the following function.

$f(x) = x^2 - 8x + 1$

$x = 4$ (Use a comma to separate answers as needed.)

Score: 10 of 10 pts | 6 of 24

4.1.43

Determine all critical points for the following function.

$f(x) = 3x(8 - x)^3$

$x =$ 2,8 (Use a comma to separate answers as needed.)

Score: 10 of 10 pts | 7 of 24 | **Test Score:** 100%, 250 of 250 pt

4.2.1 Question Help

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.

$f(x) = 2x^2 - 5x - 3, \quad [-1,2]$

The value(s) of c that satisfy the equation $\frac{f(b) - f(a)}{b - a} = f'(c)$ is/are $\frac{1}{2}$.

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

Score: 10 of 10 pts | 8 of 24 | **Test Score:** 100%, 250 of 250

4.2.19 Question Help

Show that the function $f(x) = x^4 + 8x + 2$ 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. Rolle's Theorem
- B. Extreme value theorem
- C. Mean value theorem
- D. Intermediate value theorem ✔

To apply this theorem, evaluate the function $f(x) = x^4 + 8x + 2$ at each endpoint of the interval $[-1, 0]$.

$f(-1) =$ -5 (Simplify your answer.)

$f(0) =$ 2 (Simplify your answer.)

According to the intermediate value theorem, $f(x) = x^4 + 8x + 2$ 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 $f(x) = x^4 + 8x + 2$.

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

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

- Yes
- No ✔

The function $f(x) = x^4 + 8x + 2$ 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 $f(x) = x^4 + 8x + 2$ 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 $[-1, 0]$.

Score: 10 of 10 pts | 9 of 24 | Test Sc

4.2.41

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

$v = 9.8t + 13,\ s(0) = 19$

$s(t) = 4.9t^2 + 13t + 19$

Score: 10 of 10 pts | 10 of 24 | Test Score: 100%, 250

4.2.47 Question H

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

$a = -64 \sin 8t,\ v(0) = 8,\ s(0) = -2$

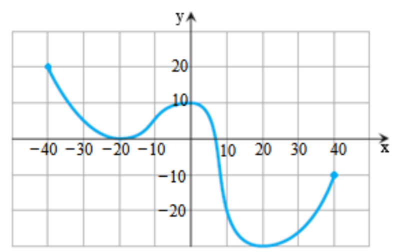
$s(t) = \sin(8t) - 2$

Score: 10 of 10 pts | 11 of 24 | Test Score: 100%, 250 of 250 pts

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) $(-20,0),(20,40)$.
(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) $(-40,-20),(0,20)$.
(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) $(-40,20)$.
(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) $(0,10),(40,-10)$.
(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) $(20,-30)$.
(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) $(-20,0)$.
(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.

Score: 20 of 20 pts | 12 of 24 | **Test Score:** 100%, 250 of 25(

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. $\left(0,\frac{1}{3}\right)$
(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 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. $(-\infty,0),\left(\frac{1}{3},\infty\right)$
(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 $\frac{1}{27}$ and occur at x = ☐.

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

C. The absolute and local maximum are both 0 and occur at 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 simplified fraction.)

A. The absolute and local minimum are both 0 and occur at x = ☐.

B. The absolute and local minimum are both $\frac{1}{3}$ and occur at x = ☐.

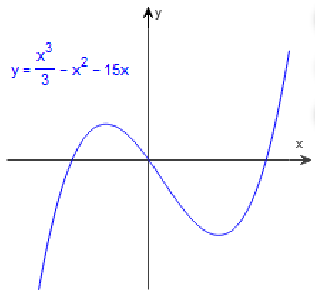
C. There is no absolute minimum. The local minimum is 0 and occurs at $x=0$.

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

4.4.1

Question Help

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 $y = \frac{x^3}{3} - x^2 - 15x$ has a point of inflection at $\left(1, -\frac{47}{3}\right)$.

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

Choose the correct answer regarding local maxima and minima.

- A. Local maximum: 27 at $x = -3$
  Local minimum: $-\frac{175}{3}$ at $x = 5$
- B. No local maxima or minima
- C. Local maximum: $-\frac{175}{3}$ at $x = 5$
  Local minimum: 27 at $x = -3$
- D. Local minima: $-\frac{47}{3}$ at $x = 1$

Choose the correct answer regarding concavity.

- A. Concave down on $(-\infty, \infty)$
- B. Concave down on $(-\infty, 1)$
  Concave up on $(1, \infty)$
- C. Concave up on $(-\infty, \infty)$
- D. Concave up on $(-\infty, 1)$
  Concave down on $(1, \infty)$

4.4.17

Question Help

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

Choose the correct answer regarding local extreme points.

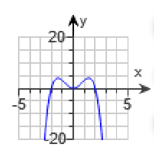
- A. Local maximum: $(-\sqrt{2}, -4)$, $(\sqrt{2}, -4)$
  Local minimum: $(0,0)$
- B. Local minimum: $(-\sqrt{2}, -4)$, $(\sqrt{2}, -4)$
  Local maximum: $(0,0)$
- C. No local extreme points

Choose the correct answer regarding inflection points.

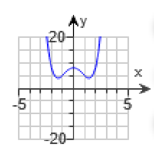
- A. Inflection points: $(-\sqrt{2}, -4)$, $(\sqrt{2}, -4)$
- B. No inflection points
- C. Inflection points: $\left(-\frac{\sqrt{6}}{3}, -\frac{20}{9}\right), \left(\frac{\sqrt{6}}{3}, -\frac{20}{9}\right)$

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

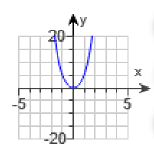
A.



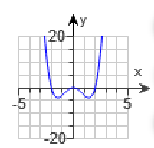
B.



C.



D.



Score: 10 of 10 pts | 15 of 24 | Test Score: 100%, 250 of 250 pt

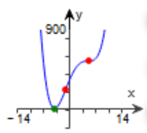
4.4.51 | Question Help

The first derivative of a continuous function $y = f(x)$ is $y' = x(x-9)^2$. Find y'' and then use the graphing procedure to sketch the general shape of the graph of f.

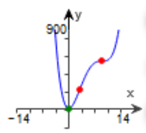
$y'' = 3x^2 - 36x + 81$

Choose the correct graph below.

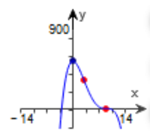
A.



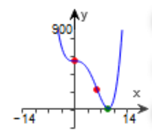
B.



C.



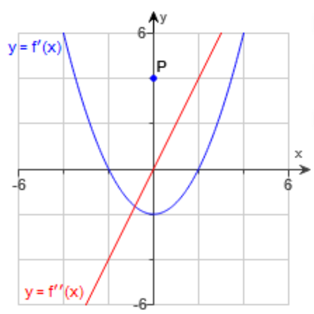
D.



Score: 10 of 10 pts | 16 of 24 | Test Score: 100%, 250 of 250

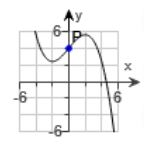
4.4.71 | Question Help

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.

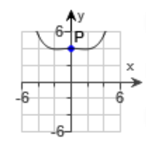


Which of the following is the correct graph of the function $y = f(x)$?

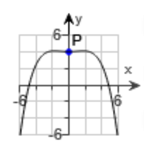
A.



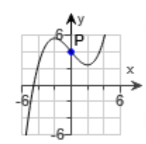
B.



C.



D.



Score: 10 of 10 pts | 17 of 24 | Test Score: 100%, 250 of 2

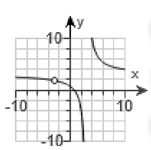
4.4.75 | Question Help

Graph the following rational function.

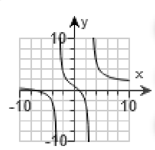
$$y = \frac{3x^2 + 7x - 6}{x^2 - 9}$$

Choose the correct graph below.

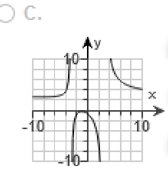
A.



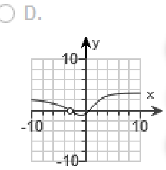
B.



C.



D.



Score: 10 of 10 pts

Test Score: 100%, 250 of 250 pts

4.5.7

Question Help

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 600 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 45000 m^2.

The length of the shorter side of the rectangular plot is 150 m.

The length of the longer side of the rectangular plot is 300 m.

Score: 10 of 10 pts

Test Score: 100%, 250 of 250 pts

4.5.9

Question Help

A rectangular tank that is 256 ft^3 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.)

Score: 10 of 10 pts

4.7.11

Find the antiderivative of the function $f(x) = -12 \sin(12x)$ when $C = 0$.

The antiderivative is $\cos(12x)$.

Score: 10 of 10 pts

4.7.17

Find the indefinite integral $\int (12x + 7)dx$.

$\int (12x + 7)dx = 6x^2 + 7x + c$

(Use C as an arbitrary constant.)

Score: 10 of 10 pts

4.7.35

Find the indefinite integral $\int -2 \cos t \, dt$.

$\int -2 \cos t \, dt = -2 \sin t + c$

(Use C as an arbitrary constant.)

Score: 10 of 10 pts

23 of 24

4.7.41

Find the indefinite integral $\int -\frac{\csc\theta\cot\theta}{5}\,d\theta$.

$\int -\frac{\csc\theta\cot\theta}{5}\,d\theta = \frac{\csc\theta}{5} + c$

(Use C as an arbitrary constant.)

Score: 10 of 10 pts

24 of 24

4.7.71

Find the function y(x) satisfying $\frac{dy}{dx} = 8x - 9$ and $y(8) = 0$.

The function y(x) satisfying $\frac{dy}{dx} = 8x - 9$ and $y(8) = 0$ is $y(x) = 4x^2 - 9x - 184$.