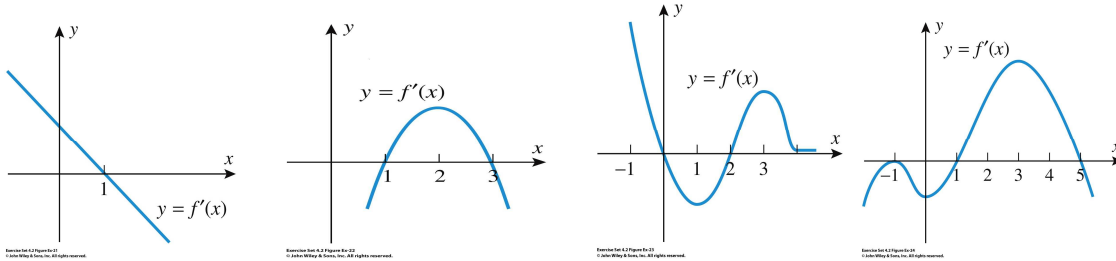


Absolute Maxima and Minima

Warm-up: For each of the figures below give the intervals of increasing, decreasing, concave up, concave down, and inflection points.



Absolute Extrema

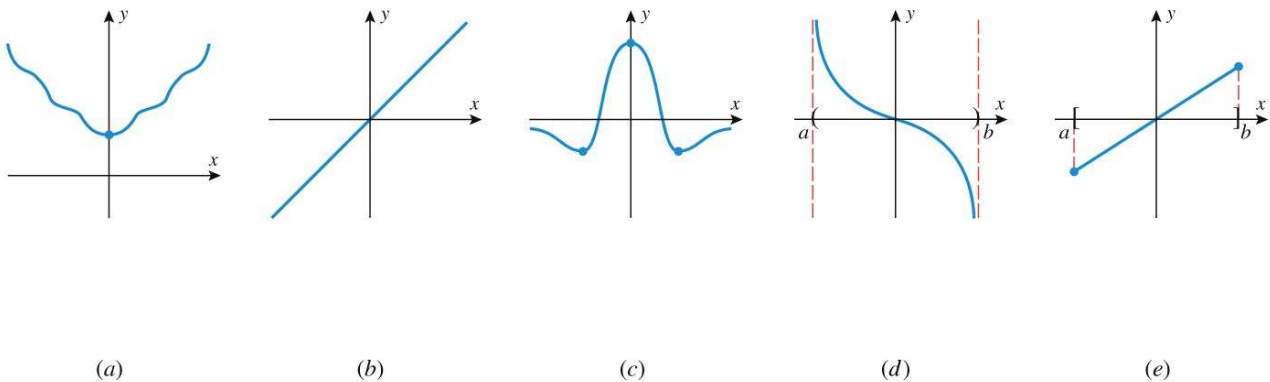


Figure 4.4.1
© John Wiley & Sons, Inc. All rights reserved.

Absolute Extrema on Infinite Intervals

Extreme Value Theorem: If a function is continuous on a closed interval, then _____

If a function is continuous on a closed interval, the absolute extrema must occur _____

Absolute Maxima and Minima

Steps for Finding the Absolute Extrema of a Continuous Function on a Closed Interval [a, b]

1. _____
 2. _____
 3. _____
-

Example 1 Find the absolute max and min values of $f(x) = 2x^3 - 15x^2 + 36x$ on $[1, 5]$

Example 2 Find the absolute extrema of $f(x) = 6x^{4/3} - 3x^{1/3}$ on $[-1, 1]$

Absolute Extrema on Infinite Intervals

ABSOLUTE EXTREMA ON INFINITE INTERVALS

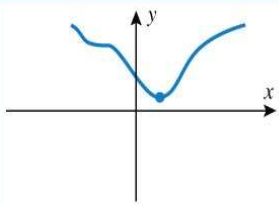
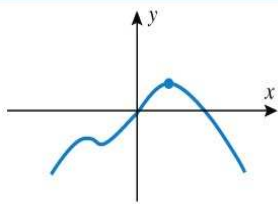
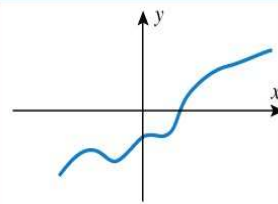
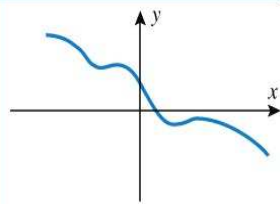
LIMITS	$\lim_{x \rightarrow -\infty} f(x) = +\infty$ $\lim_{x \rightarrow +\infty} f(x) = +\infty$	$\lim_{x \rightarrow -\infty} f(x) = -\infty$ $\lim_{x \rightarrow +\infty} f(x) = -\infty$	$\lim_{x \rightarrow -\infty} f(x) = -\infty$ $\lim_{x \rightarrow +\infty} f(x) = +\infty$	$\lim_{x \rightarrow -\infty} f(x) = +\infty$ $\lim_{x \rightarrow +\infty} f(x) = -\infty$
CONCLUSION IF f IS CONTINUOUS EVERYWHERE				
GRAPH				

Table 4.4.2
© John Wiley & Sons, Inc. All rights reserved.

Absolute Maxima and Minima

If a continuous function has an absolute extremum on an open interval, then it must occur at a critical point.

Example 3 Give the value and location of all absolute extrema of $f(x) = 3x^4 + 4x^3$.

Absolute Extrema on Open Intervals

ABSOLUTE EXTREMA ON OPEN INTERVALS

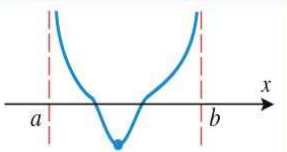
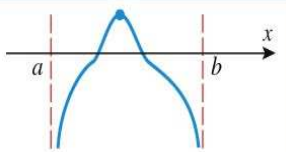
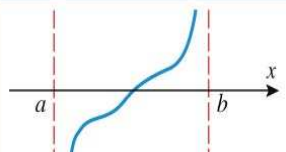
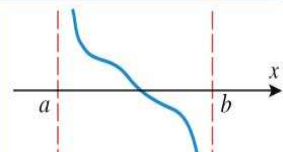
LIMITS	$\lim_{x \rightarrow a^+} f(x) = +\infty$ $\lim_{x \rightarrow b^-} f(x) = +\infty$	$\lim_{x \rightarrow a^+} f(x) = -\infty$ $\lim_{x \rightarrow b^-} f(x) = -\infty$	$\lim_{x \rightarrow a^+} f(x) = -\infty$ $\lim_{x \rightarrow b^-} f(x) = +\infty$	$\lim_{x \rightarrow a^+} f(x) = +\infty$ $\lim_{x \rightarrow b^-} f(x) = -\infty$
CONCLUSION IF f IS CONTINUOUS ON (a, b)				
GRAPH				

Table 4.4.3

© John Wiley & Sons, Inc. All rights reserved.

Example 5 Determine whether the function $f(x) = \frac{1}{x^2 - x}$ has any absolute extrema on the interval $(0, 1)$. If so, find them and state where they occur.

Absolute Maxima and Minima

Class Work

Find the absolute maximum and minimum values of f on the given interval, and state where those values occur.

1. $f(x) = 4x^2 - 12x + 10$; $[1, 2]$

2. $f(x) = 8x - x^2$; $[0, 6]$

3. $f(x) = (x - 2)^3$; $[1, 4]$

4. $f(x) = 2x^3 + 3x^2 - 12x$; $[-3, 2]$

5. $f(x) = x^2 - x - 2$; $(-\infty, \infty)$

6. $f(x) = \frac{x-2}{x+1}$; $(-1, 5)$