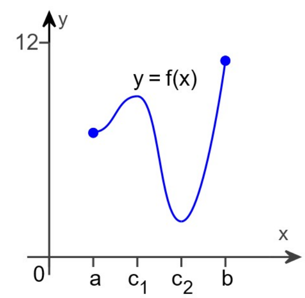
Student: Cole Lamers **Date:** 09/17/19	**Instructor:** Viktoriya Shcherban **Course:** Calc 1 11:30 AM / Internet (81749&81750) Shcherban	**Assignment:** 4.1 Extreme Values of Functions (Set 1)

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.



Let f be a function with domain D. Absolute maximum and absolute minimum values are called absolute extreme values of the function f.

The function has an absolute maximum value on D at a point c if $f(x) \le f(c)$ for all x in D.

The absolute maximum of the given function occurs at b.

The function f has an absolute minimum value on domain D at a point c if $f(x) \ge f(c)$ for all x in D.

The absolute minimum of the function f occurs at c_2.

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

The extreme value theorem states that if a function f is continuous on a closed interval [a, b], then f attains both an absolute maximum value and an absolute minimum value on [a, b].

The given function is continuous on its domain [a, b].

The domain of the given function is closed.

Since the given function f satisfies the condition for the extreme value theorem, the function f attains both an absolute maximum value and an absolute minimum value on its domain.

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Find the graph given the following table.

x	f′(x)
a	0
b	does not exist
c	4

To determine the graph of the function from the table of values, interpret the derivatives at each of the x-values.

If the derivative of the function at a certain x-value is zero, the graph will be smooth at that point.

If the derivative of the function at a certain x-value does not exist, the graph will have a corner, a cusp, a vertical tangent, or a discontinuity at that point.

For this problem, assume the graph has a corner if the derivative of the function at a certain x-value does not exist.

If the derivative of the function at a certain x-value is positive, the graph will be increasing at that point.

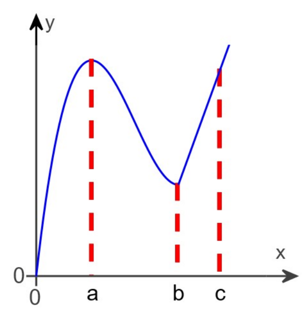
If the derivative of the function at a certain x-value is negative, the graph will be decreasing at that point.

The graph will be smooth when $x = a$.

The graph will have a corner when $x = b$.

The graph will be increasing when $x = c$.

The graph of the function is shown below.



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

$f(x) = \frac{8}{9}x + 5, \qquad -9 \le x \le 9$

Let f be a function with domain D. Then f has an absolute maximum value on D at a point c if $f(x) \le f(c)$ for all x in D. The function f has an absolute minimum value on D at c if $f(x) \ge f(c)$ for all x in D.

To find the absolute extrema of a continuous function f on a finite closed interval, evaluate f at all critical points and endpoints, and take the largest and smallest of the values.

A critical point of f is an interior point of the domain of a function f where f ' is zero or undefined.

To find all critical points, first find f '(x).

$f(x) = \frac{8}{9}x + 5$

$f'(x) = \frac{8}{9}$

Now, set $f'(x) = 0$ and solve.

$f'(x) = \frac{8}{9} = 0$

Since $\frac{8}{9} \ne 0$, there are no critical points. Therefore, the function's absolute extrema occur at the endpoints.

Evaluate f(x) at $x = -9$ and $x = 9$.

$f(x) = \frac{8}{9}x + 5$	$f(x) = \frac{8}{9}x + 5$
$f(-9) = \frac{8}{9}(-9) + 5$	$f(9) = \frac{8}{9}(9) + 5$
$f(-9) = -3$	$f(9) = 13$

The absolute maximum of the function $f(x) = \frac{8}{9}x + 5$ on the interval $-9 \le x \le 9$ has a value of 13.

The absolute minimum of the function $f(x) = \frac{8}{9}x + 5$ on the interval $-9 \le x \le 9$ has a value of -3.

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

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

Let f be a function with domain D. Then f has an absolute maximum value on D at a point c if $f(x) \le f(c)$ for all x in D. The function f has an absolute minimum value on D at c if $f(x) \ge f(c)$ for all x in D.

To find the absolute extrema of a continuous function f on a finite closed interval, evaluate f at all critical points and endpoints, and take the largest and smallest of the values.

A critical point of f is an interior point of the domain of a function f where f ' is zero or undefined.

To find all critical points, first find f '(x).

$f(x) = -x^2 + 9$
$f'(x) = -2x$

Now, set $f'(x) = 0$ and solve.

$-2x = 0$
$x = 0$

Evaluate f(x) at the critical point, $x = 0$.

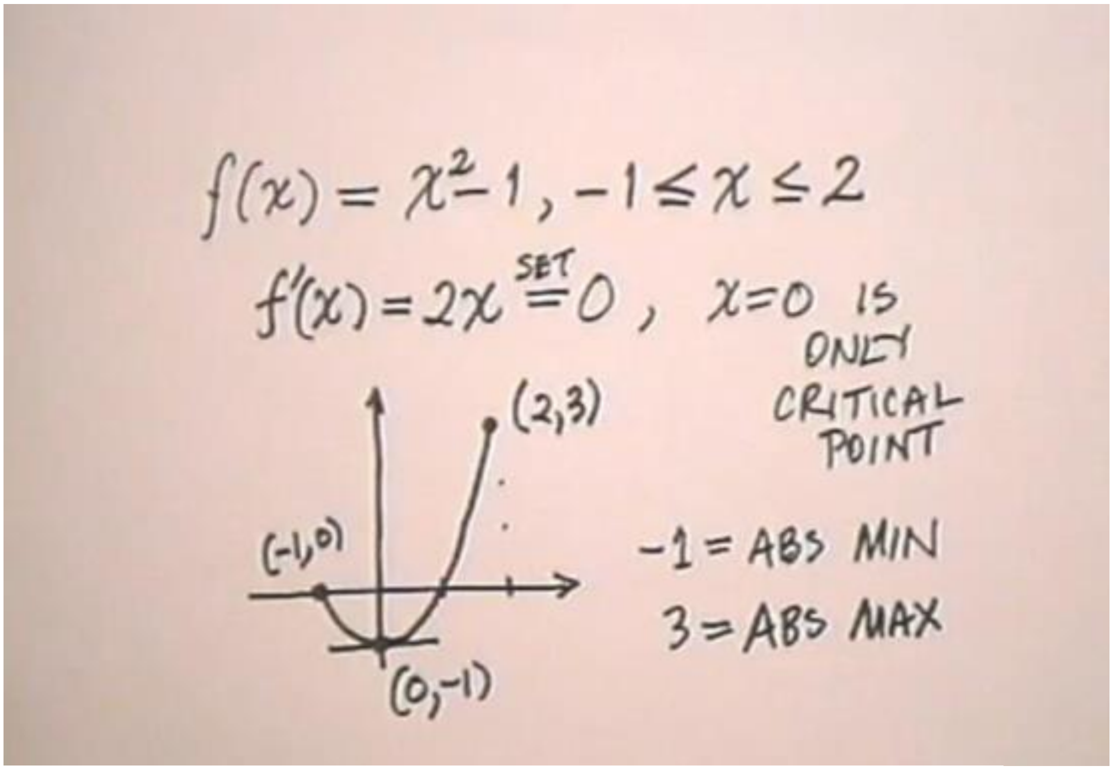
$f(x) = -x^2 + 9$
$f(0) = -(0)^2 + 9$
$f(0) = 9$

Evaluate f(x) at the endpoints, $x = -3$ and $x = 4$.

$f(x) = -x^2 + 9$	$f(x) = -x^2 + 9$
$f(-3) = -(-3)^2 + 9$	$f(4) = -(4)^2 + 9$
$f(-3) = 0$	$f(4) = -7$

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

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



Use the given function and the given interval to complete parts **a** and **b**.

$f(x) = -2x^3 + 15x^2 - 24x$ on [0,5] — Both x points

a. Determine the absolute extreme values of f on the given interval when they exist.
b. Use a graphing utility to confirm your conclusions.

This equation is showing the numbers in the brackets as starting and ending x points. So essentially what that is saying is **$0 < x < 5$.** That will help you determine the lowest and highest values within the function.