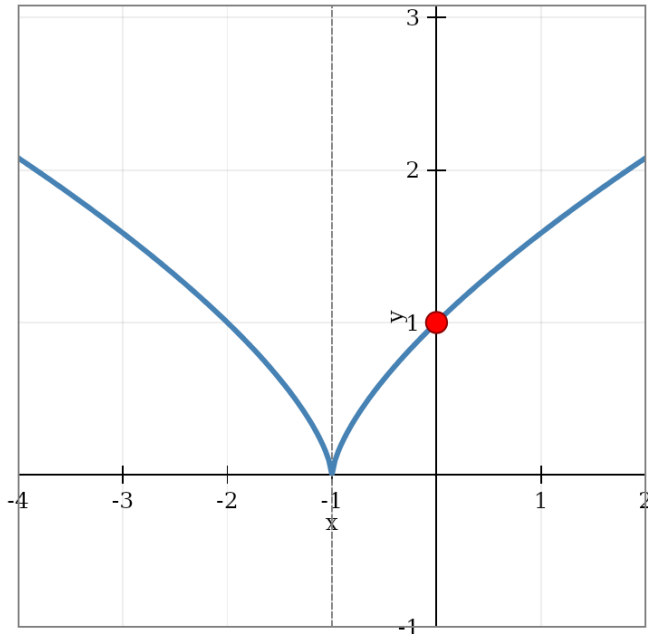


Derivatives and Critical Points - Intro

1 At the highlighted point, is the slope positive, negative, or zero?



A

Can't be determined

B

Negative

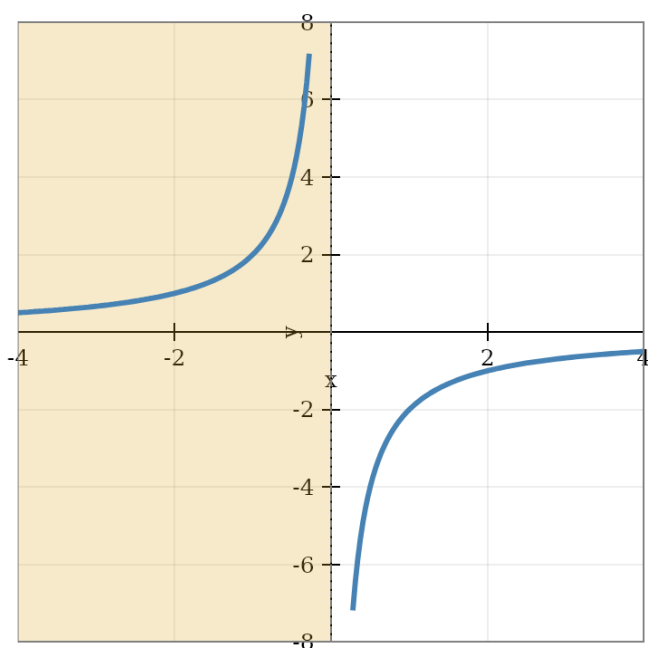
C

Zero

D

Positive

2 In the highlighted interval, is the concavity positive, negative, or zero?



A

Positive

B

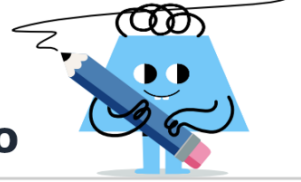
Zero

C

Negative

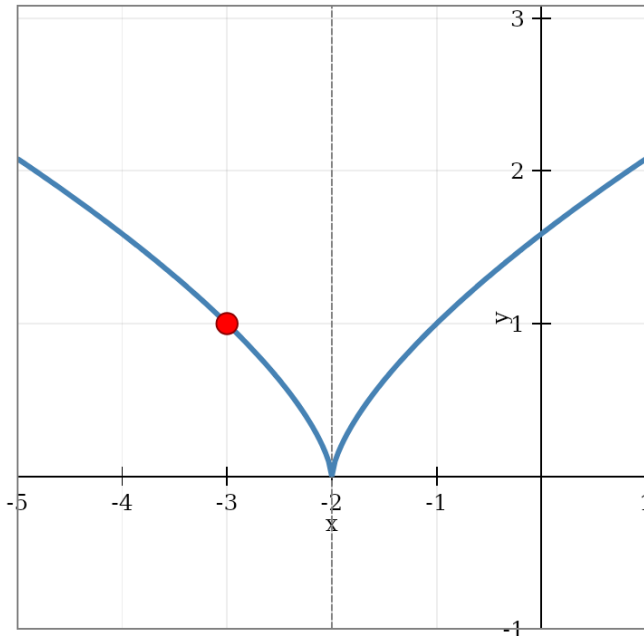
D

Can't be determined



Derivatives and Critical Points - Intro

3 At the highlighted point, what are the signs of the slope and the concavity?



A

Slope positive, concavity positive

B

Slope negative, concavity negative

C

Slope positive, concavity zero

D

Slope positive, concavity negative

4 What does this tell you about the function at that point?

$$f'(-1) = -30.$$

A The function is decreasing there.

B The function is concave down there.

C The function is increasing there.

D The function is concave up there.

5 What does this tell you about the derivatives at that point?

At $x = -1$, the function is concave down.

A $f'(x)$ is positive there

B $f''(x)$ is positive there

C $f'(x)$ is negative there

D $f''(x)$ is negative there

6 On the interval $(4, \infty)$, is the slope positive or negative?

A Negative

B Positive

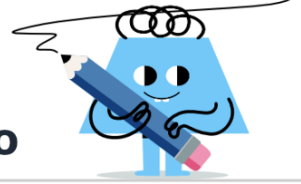
C Can't be determined

7 On the interval $(-\infty, 0)$, is the concavity positive or negative?

A Can't be determined

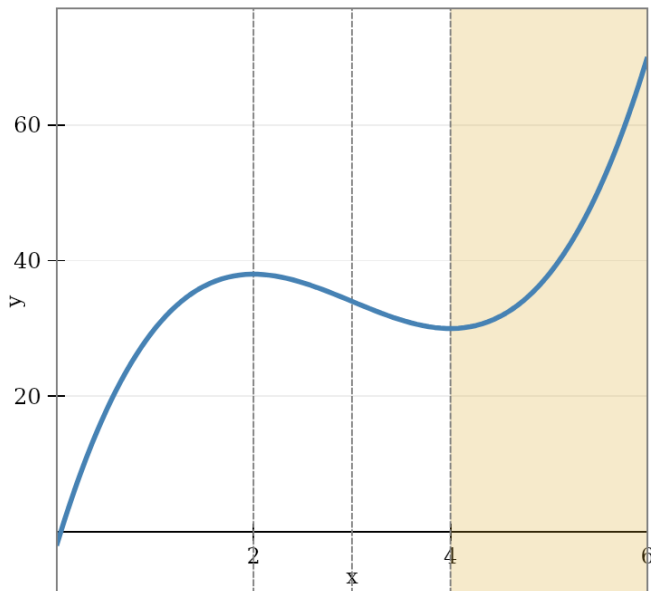
B Positive

C Negative



Derivatives and Critical Points - Intro

8 In the highlighted interval, is $f'(x)$ positive, negative, or zero?



A

Can't be determined

B

Zero

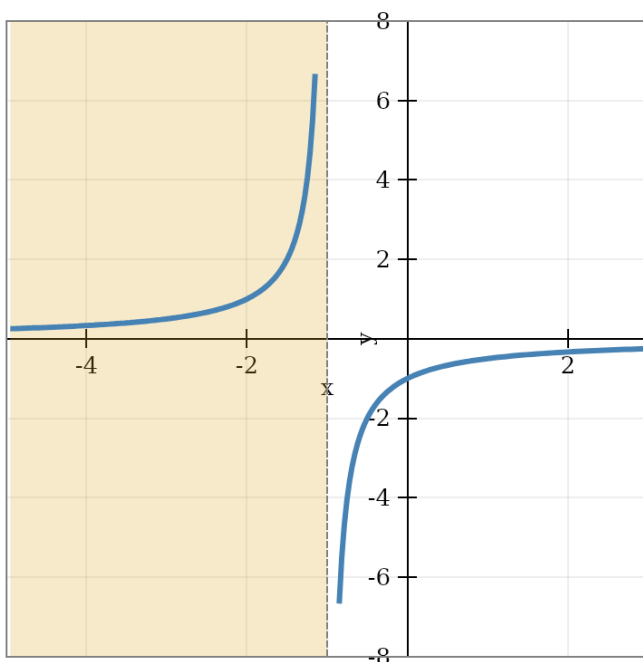
C

Positive

D

Negative

9 In the highlighted interval, is $f''(x)$ positive, negative, or zero?



A

Can't be determined

B

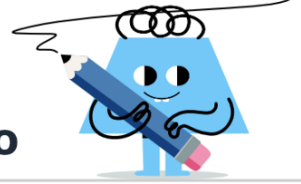
Zero

C

Negative

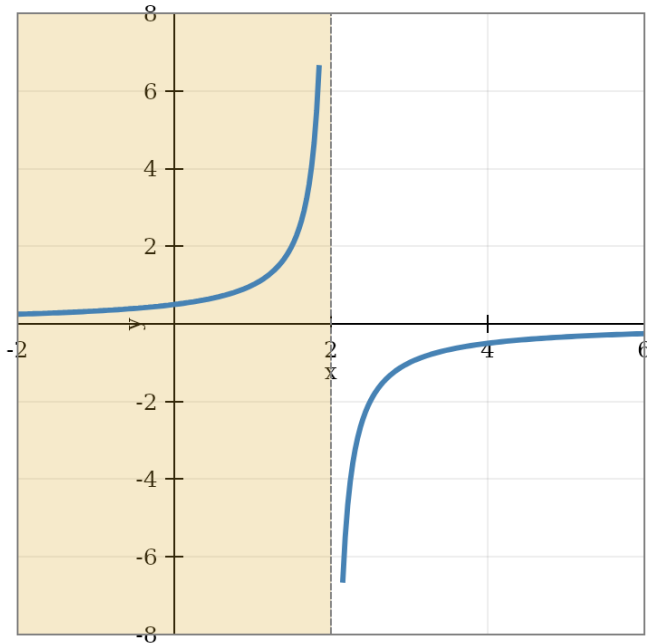
D

Positive



Derivatives and Critical Points - Intro

10 In the highlighted interval, what are the signs of $f'(x)$ and $f''(x)$?



A

$f'(x)$ negative, $f''(x)$ positive

B

$f'(x)$ positive, $f''(x)$ positive

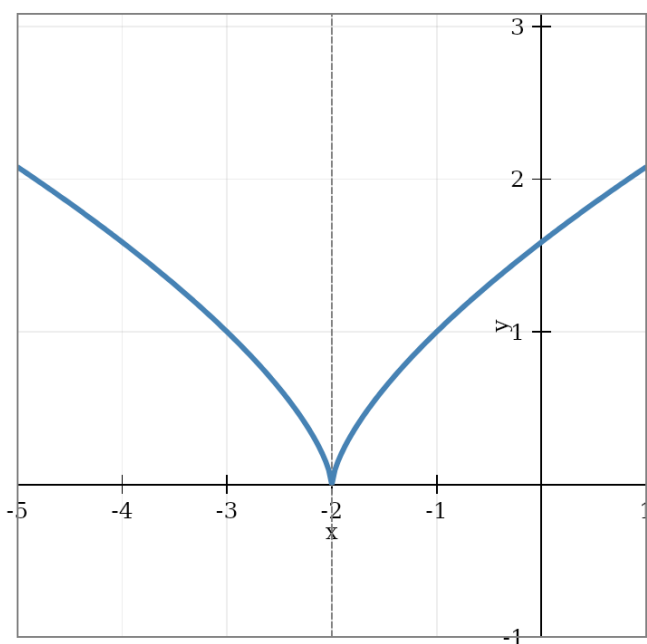
C

$f'(x)$ positive, $f''(x)$ zero

D

$f'(x)$ positive, $f''(x)$ negative

11 On which interval(s) is the slope positive?



A

$(-\infty, -2)$

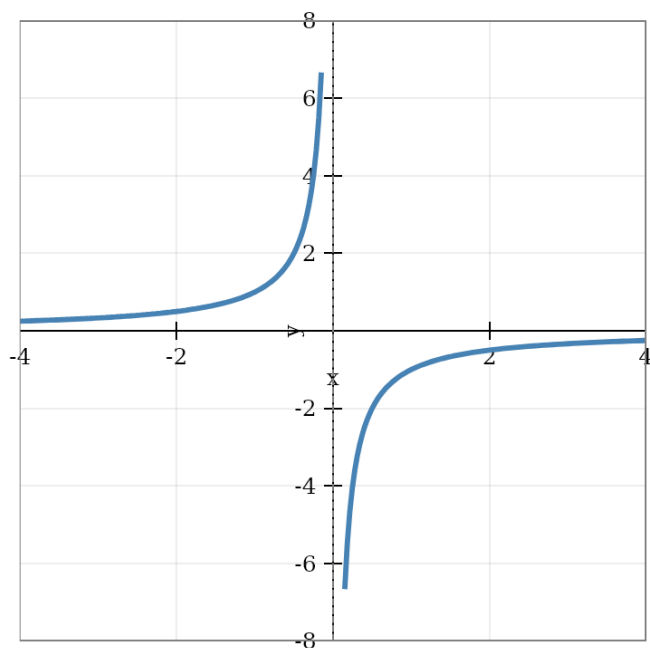
B

$(-2, \infty)$



Derivatives and Critical Points - Intro

12 On which interval(s) is the concavity positive?



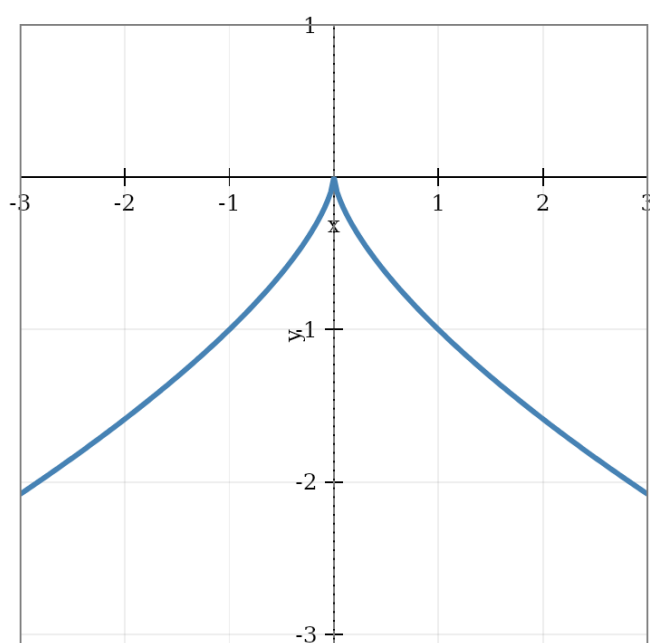
A

$$(0, \infty)$$

B

$$(-\infty, 0)$$

13 On which interval(s) is the slope negative and the concavity positive?



A

$$(-\infty, 0)$$

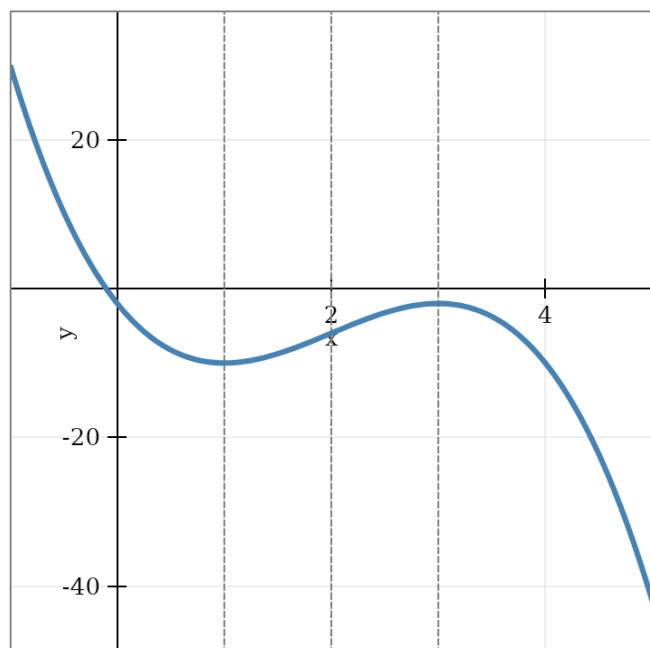
B

$$(0, \infty)$$



Derivatives and Critical Points - Intro

14 On which interval(s) is the first derivative negative?



A

$$(1, 2) \cup (2, 3)$$

B

$$(-\infty, 1) \cup (3, \infty)$$

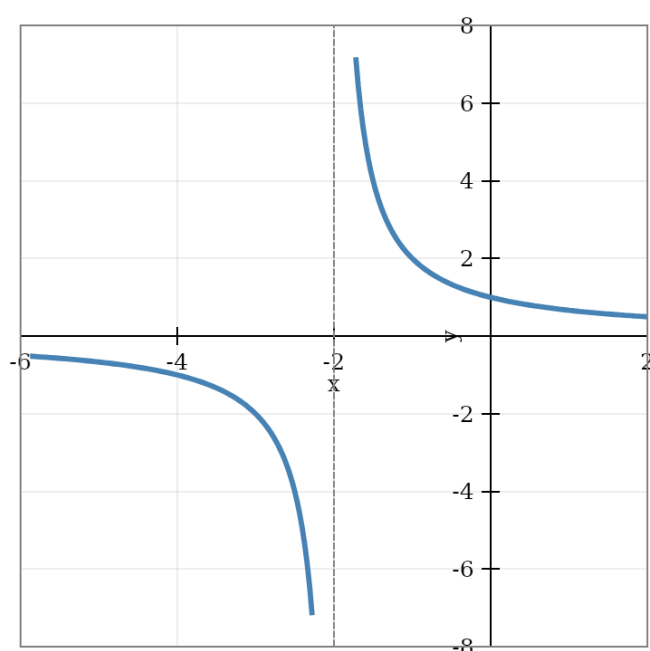
C

$$(-\infty, 1)$$

D

$$(1, 2)$$

15 On which interval(s) is the second derivative positive?



A

$$(-\infty, -2)$$

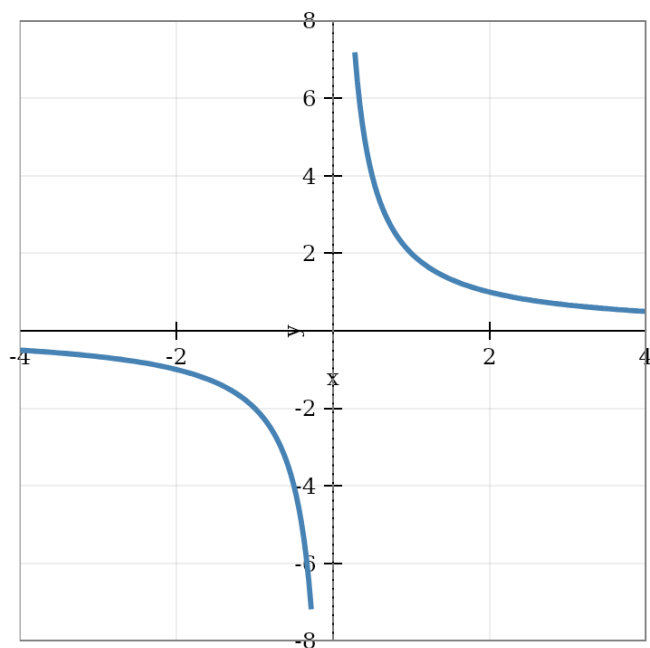
B

$$(-2, \infty)$$



Derivatives and Critical Points - Intro

16 On which interval(s) is the first derivative negative and the second derivative negative?



A

 $(0, \infty)$

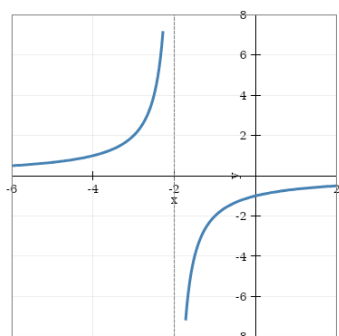
B

 $(-\infty, 0)$

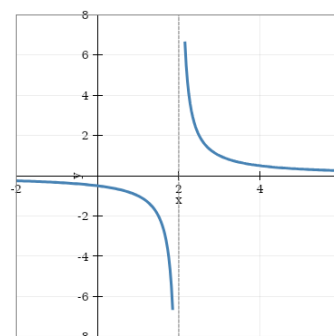
17 Which graph matches this derivative chart?

Interval	$f'(x)$	$f''(x)$
$(-\infty, 2)$	-	-
$(2, \infty)$	-	+

A



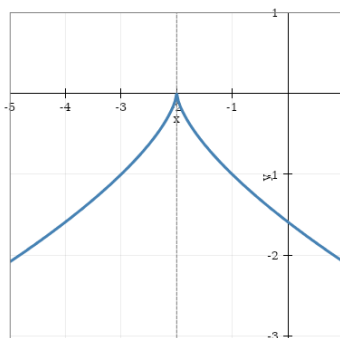
B





Derivatives and Critical Points - Intro

18 Which derivative chart matches this graph?



A

Interval	$f'(x)$	$f''(x)$
$(-\infty, -2)$	-	+
$(-2, \infty)$	+	+

B

Interval	$f'(x)$	$f''(x)$
$(-\infty, -2)$	+	+
$(-2, \infty)$	-	+

19 Which derivative chart is correct for the interval $(-1, 0)$?

$$f(x) = 2x^3 + 6x^2 + 3$$

A

Interval	$f'(x)$	$f''(x)$
$(-\infty, -2)$	+	-
$(-2, -1)$	-	-
$(-1, 0)$	-	+
$(0, \infty)$	+	+

B

Interval	$f'(x)$	$f''(x)$
$(-\infty, -2)$	+	-
$(-2, -1)$	-	-
$(-1, 0)$	+	-
$(0, \infty)$	+	+



Derivatives and Critical Points - Intro

20 On which interval(s) is the function decreasing?

Interval	$f'(x)$	$f''(x)$
$(-\infty, -1)$	-	+
$(-1, 1)$	+	+
$(1, 3)$	+	-
$(3, \infty)$	-	-

A

$$(-\infty, -1) \cup (-1, 1)$$

B

$$(1, 3) \cup (3, \infty)$$

C

$$(-1, 1) \cup (1, 3)$$

D

$$(-\infty, -1) \cup (3, \infty)$$

21 Which derivative chart matches this function?

$$f(x) = -2x^3 + 18x^2 - 48x - 2$$

A

Interval	$f'(x)$	$f''(x)$
$(-\infty, 4)$	-	+
$(4, 5)$	+	+
$(5, 6)$	+	-
$(6, \infty)$	-	-

B

Interval	$f'(x)$	$f''(x)$
$(-\infty, 2)$	-	+
$(2, 3)$	+	+
$(3, 4)$	+	-
$(4, \infty)$	-	-

**Derivatives and Critical Points - Intro**

22 Which derivative chart matches these intervals of increase and decrease?

**Increasing on $(2, 3)$ and $(3, 4)$;
decreasing on $(-\infty, 2)$ and $(4, \infty)$.**

A

Interval	$f'(x)$	$f''(x)$
$(-\infty, 2)$	+	+
$(2, 3)$	-	+
$(3, 4)$	-	-
$(4, \infty)$	+	-

B

Interval	$f'(x)$	$f''(x)$
$(-\infty, 2)$	-	+
$(2, 3)$	+	+
$(3, 4)$	+	-
$(4, \infty)$	-	-

23 On the interval $(0, \infty)$, what are the signs of the slope and concavity?

A Slope positive, concavity negative

B Slope negative, concavity positive

C Slope negative, concavity negative

D Slope positive, concavity positive

24 What are the critical numbers (x-values) of the extrema (maxima or minima)?

A $x = -3$ B $x = -3, -1$ C $x = -2$ D $x = -3, -2, -1$

25 What are the critical points of the extrema (maxima or minima)?

A $(-1, 14)$ and $(3, -50)$ B $(-1, -50)$ and $(3, 14)$ C $(1, -18)$ D $(-1, 0)$ and $(3, 0)$

26 On the interval $(0, 1)$, is $f'(x)$ positive, negative, or zero?

$$f(x) = -2x^3 + 6x^2 + 3$$

A Positive

B Can't be determined

C Negative

D Zero



Derivatives and Critical Points - Intro

27 Using the chart, is $x = 0$ a maximum, a minimum, or neither?

Interval	$f'(x)$	$f''(x)$
$(-\infty, 0)$	+	-
$(0, 1)$	-	-
$(1, 2)$	-	+
$(2, \infty)$	+	+

A

Maximum

B

Neither

C

Minimum

28 Using the chart, is it true that $x = -2$ is a minimum?

Interval	$f'(x)$	$f''(x)$
$(-\infty, -2)$	+	-
$(-2, 0)$	-	-
$(0, 2)$	-	+
$(2, \infty)$	+	+

A

No

B

Yes



Derivatives and Critical Points - Intro

- 29** On the interval $(4, \infty)$, is $f'(x)$ positive, negative, or zero?

$$f(x) = 2x^3 - 18x^2 + 48x - 3$$

- | | |
|---|---------------------|
| A | Can't be determined |
| B | Positive |
| C | Negative |
| D | Zero |

- 30** On the interval $(-3, -1)$, what are the signs of $f'(x)$ and $f''(x)$?

$$f(x) = 2x^3 + 6x^2 - 18x - 2$$

- | | |
|---|-------------------------------------|
| A | $f'(x)$ negative, $f''(x)$ negative |
| B | $f'(x)$ positive, $f''(x)$ negative |
| C | $f'(x)$ negative, $f''(x)$ positive |
| D | $f'(x)$ positive, $f''(x)$ positive |

- 31** On the interval $(-\infty, -1)$, is the slope positive or negative?

$$f(x) = -2x^3 + 6x^2 + 18x - 3$$

- | | |
|---|---------------------|
| A | Positive |
| B | Can't be determined |
| C | Negative |

- 32** On the interval $(2, \infty)$, is the concavity positive or negative?

$$f(x) = -2x^3 + 24x - 1$$

- | | |
|---|---------------------|
| A | Can't be determined |
| B | Negative |
| C | Positive |

- 33** On the interval $(2, 4)$, what are the signs of the slope and concavity?

$$f(x) = -2x^3 + 12x^2 + 1$$

- | | |
|---|------------------------------------|
| A | Slope positive, concavity negative |
| B | Slope positive, concavity positive |
| C | Slope negative, concavity positive |
| D | Slope negative, concavity negative |

- 34** Given the derivative shown, where is the graph sloping up?

$$f'(x) = -6x^2 - 12x + 18$$

- | | |
|---|---------------------|
| A | $x < -1$ |
| B | $x < -3$ or $x > 1$ |
| C | $x > -1$ |
| D | $-3 < x < 1$ |

- 35** Given the derivative shown, is the graph concave up at $x = 5$?

$$f''(x) = -12x + 12$$

- | | |
|---|---------------------|
| A | No |
| B | Yes |
| C | Can't be determined |

- 36** What are the critical values (y-values) of the extrema (maxima or minima)?

- | | |
|---|--------------|
| A | $y = -3$ |
| B | $y = -3, 61$ |
| C | $y = 29$ |
| D | $y = 0, 4$ |



Derivatives and Critical Points - Intro

37 Is $x = 3$ a maximum, a minimum, or neither?

A

Neither

B

Maximum

C

Minimum

38 What are the critical numbers (x-values) of the extrema (maxima or minima)?

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

A

$x = -2$

B

$x = 0$

C

$x = -2, 0, 2$

D

$x = -2, 2$

39 What are the critical points of the extrema (maxima or minima)?

$$f(x) = -2x^3 + 6x + 4$$

A

$(0, 4)$

B

$(-1, 0)$ and $(1, 8)$

C

$(-1, 8)$ and $(1, 0)$

D

$(-1, 0)$ and $(1, 0)$

40 Where is the first derivative equal to zero? Give the x-values.

$$f(x) = 2x^3 - 54x + 1$$

A

$x = 0$

B

$x = -3, 0, 3$

C

$x = -3$

D

$x = -3$ or $x = 3$

41 Where is the second derivative equal to zero? Give the x-value.

$$f(x) = -2x^3 + 6x + 4$$

A

$x = -1$

B

$x = 0$

C

$x = -1$ or $x = 1$

D

$x = -1, 0, 1$

42 Where is the first or second derivative equal to zero? Give the x-values.

$$f(x) = 2x^3 - 6x^2 - 18x + 4$$

A

$x = -1, 1, 3$

B

$x = 1$

C

$x = -1$ or $x = 3$

D

$x = -1$

43 On which range is the function not differentiable (undefined)?

$$f(x) = \sqrt{x - 2}$$

A

$x < -2$

B

$x = 2$

C

$x < 2$

D

$x > 2$



Derivatives and Critical Points - Intro

- 44** What are the critical values (y-values) of the extrema (maxima or minima)?

$$f(x) = -2x^3 - 6x^2 - 4$$

A $y = -12, -4$

B $y = -8$

C $y = -12$

D $y = -2, 0$

- 45** What is the absolute minimum on the interval? Give the point.

A $(-1, 11)$

B $(-3, 3)$

C $(-5, 43)$

D $(0, 3)$

- 46** What are the extreme values (y-values) on the interval?

A Maximum value 67, minimum value 3

B Maximum value 67, minimum value 1

C Maximum value 69, minimum value 3

D Maximum value 3, minimum value 67

- 47** What is the critical number (x-value) of the absolute maximum?

A -2

B -1

C 0

D -3

- 48** What is the absolute minimum point?

A $(4, 65)$

B $(5, 51)$

C $(0, 1)$

D $(-1, 15)$

- 49** What is the absolute maximum value (y-value)?

A 32

B 29

C 31

D 30

- 50** What is the critical number (x-value) of the inflection point?

A -1

B 1

C -2

D 0

- 51** What is the inflection point?

A $(3, -36)$

B $(4, -37)$

C $(3, -37)$

D $(-37, 3)$



Derivatives and Critical Points - Intro

52 What is the critical value (y-value) of the inflection point?

- | | | | |
|---|----|---|----|
| A | 36 | B | 35 |
| C | 33 | D | 34 |

53 What are the critical numbers (x-values) of the function?

- | | |
|---|------------------|
| A | $x = -3$ |
| B | $x = -4$ |
| C | $x = -4, -2$ |
| D | $x = -4, -3, -2$ |

54 What are the critical points of the function?

- | | |
|---|------------------------|
| A | $(0, 0)$ and $(2, -8)$ |
| B | $(1, -4)$ |
| C | $(0, 0)$ and $(2, 0)$ |
| D | $(0, -8)$ and $(2, 0)$ |

55 What are the critical values (y-values) of the function?

- | | |
|---|-------------|
| A | $y = -1, 1$ |
| B | $y = 2$ |
| C | $y = 2, -6$ |
| D | $y = -2$ |

56 What are the critical numbers (x-values) of the function?

$$f(x) = 2x^3 - 6x + 3$$

- | | |
|---|----------------|
| A | $x = -1$ |
| B | $x = -1, 0, 1$ |
| C | $x = -1, 1$ |
| D | $x = 0$ |

57 What are the critical points of the function?

$$f(x) = 2x^3 - 12x^2 - 3$$

- | | |
|---|--------------------------|
| A | $(2, -35)$ |
| B | $(0, -3)$ and $(4, -67)$ |
| C | $(0, -67)$ and $(4, -3)$ |
| D | $(0, 0)$ and $(4, 0)$ |

58 What are the critical values (y-values) of the function?

$$f(x) = 2x^3 + 6x^2 + 4$$

- | | |
|---|-------------|
| A | $y = 8$ |
| B | $y = 12$ |
| C | $y = -2, 0$ |
| D | $y = 12, 4$ |

59 Is $x = -2$ a valid critical number of this function on the interval?

- | | | | |
|---|----|---|-----|
| A | No | B | Yes |
|---|----|---|-----|