



# Classify local extrema using the first derivative

**1** At  $x = -3$ , the function is increasing.

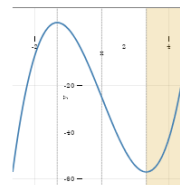
A  $f''(x)$  is negative there

B  $f'(x)$  is negative there

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

D  $f'(x)$  is positive there

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



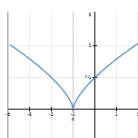
A Zero

B Negative

C Can't be determined

D Positive

**3** On which interval(s) is the first derivative positive?



A  $(-1, \infty)$

B  $(-\infty, -1)$

**4** On which interval(s) is the function decreasing?

| Interval       | $f(x)$ | $f'(x)$ |
|----------------|--------|---------|
| $(-\infty, 0)$ | -      | +       |
| $(0, 2)$       | +      | +       |
| $(2, 4)$       | +      | -       |
| $(4, \infty)$  | -      | -       |

A  $(-\infty, 0) \cup (4, \infty)$

B  $(2, 4) \cup (4, \infty)$

C  $(-\infty, 0) \cup (0, 2)$

D  $(0, 2) \cup (2, 4)$

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

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

$$f'(x) = -6x^2 - 24x$$

A  $x = -2$

B  $x = -4, 0$

C  $x = -4$

D  $x = -4, -2, 0$

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

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

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

A  $(-1, 0)$  and  $(3, 0)$

B  $(-1, -52)$  and  $(3, 12)$

C  $(-1, 12)$  and  $(3, -52)$

D  $(1, -20)$

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

$$f(x) = -2x^3 + 18x^2 - 48x - 1$$

A  $x = 2, 4$

B  $x = 3$

C  $x = 2, 3, 4$

D  $x = 2$

**8** On the interval  $(-\infty, -3)$ , is the slope positive or negative?

$$f(x) = 2x^3 - 54x - 4$$

$$f'(x) = 6x^2 - 54$$

A Positive

B Can't be determined

C Negative



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**9**

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

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

**10**

Using the chart, is it true that  $x = 0$  is a maximum?

| Interval        | $f'(x)$ | $f''(x)$ |
|-----------------|---------|----------|
| $(-\infty, -4)$ | -       | +        |
| $(-4, -2)$      | +       | +        |
| $(-2, 0)$       | +       | -        |
| $(0, \infty)$   | -       | -        |

**11**

Using the chart, is  $x = 1$  a maximum, a minimum, or neither?

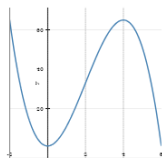
| Interval       | $f'(x)$ | $f''(x)$ |
|----------------|---------|----------|
| $(-\infty, 1)$ | +       | -        |
| $(1, 2)$       | -       | -        |
| $(2, 3)$       | -       | +        |
| $(3, \infty)$  | +       | +        |

**12**

Which graph matches this derivative chart?

| Interval       | $f'(x)$ | $f''(x)$ |
|----------------|---------|----------|
| $(-\infty, 0)$ | -       | +        |
| $(0, 2)$       | +       | +        |
| $(2, 4)$       | +       | -        |
| $(4, \infty)$  | -       | -        |

A



B

