

Exercise walk-through

5.4

Using the First Derivative Test to Determine Relative (Local) Extrema

AP Calculus BC

You must be able to

- use the sign change of f' to classify a **local extremum**

1

The method

Method — First Derivative Test

At a critical point, look at how f' changes:

- $+$ to $-$ $\rightarrow$ local **maximum**;
- $-$ to $+$ $\rightarrow$ local **minimum**;
- no sign change $\rightarrow$ neither.

Exercises 2.1·2.3

2.1 State the sign change for a local maximum.

[1]

2.2 State the sign change for a local minimum.

[1]

2.3 For $f'(x) = 2x - 4$, classify $x = 2$.

[2]

Exercises 2.1·2.3

2.1 State the sign change for a local maximum.

[1]

2.1

- f' changes from $+$ to $-$
-

2.2 State the sign change for a local minimum.

[1]

2.2

- f' changes from $-$ to $+$
-

2.3 For $f'(x) = 2x - 4$, classify $x = 2$.

[2]

2.3

- f' goes $-$ to $+$, so $x = 2$ is a local minimum

Exercises 3.1-3.2

3.1 A local maximum occurs where f' changes

[1]

☐

A $-$ to $+$

B $+$ to $-$

C stays $+$

D stays $-$

☐

3.2 A local minimum occurs where f' changes

[1]

A $+$ to $-$

B $-$ to $+$

C stays 0

D never

Exercises 3.1-3.2

3.1 A local maximum occurs where f' changes

[1]

☐

A $-$ to $+$

B $+$ to $-$

C stays $+$

D stays $-$

3.1 B

- $+$ to $-$.

3.2 A local minimum occurs where f' changes

[1]

☐

A $+$ to $-$

B $-$ to $+$

C stays 0

D never

3.2 B

- $-$ to $+$.

Exercise 3.3 (a)

3.3 $f'(x) = 2x - 4$, critical at $x = 2$.

(a) State the sign of f' for $x < 2$.

[1]

Exercise 3.3 (a)

3.3 $f'(x) = 2x - 4$, critical at $x = 2$.

(a) State the sign of f' for $x < 2$.

[1]

(a)

- negative

Exercise 3.3 (b)

3.3 $f'(x) = 2x - 4$, critical at $x = 2$.

(b) State the sign for $x > 2$.

[1]

Exercise 3.3 (b)

3.3 $f'(x) = 2x - 4$, critical at $x = 2$.

(b) State the sign for $x > 2$.

[1]

(b)

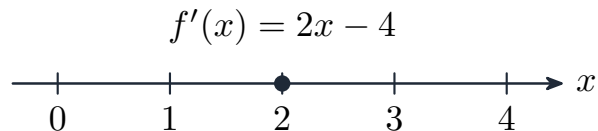
- positive

Exercise 3.3 (c)

3.3 $f'(x) = 2x - 4$, critical at $x = 2$.

(c) Classify $x = 2$.

[1]

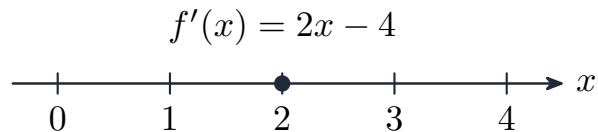


Exercise 3.3 (c)

3.3 $f'(x) = 2x - 4$, critical at $x = 2$.

(c) Classify $x = 2$.

[1]



(c)

- local minimum