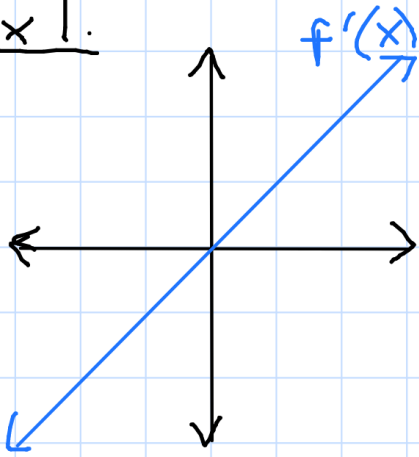


Lesson 21: Graphical Interpretation of Derivatives

Lesson 21: Graphical Interpretation of Derivatives

- Summary:
- ① Critical #(s): $f'(x) = 0$ or DNE
 - ② Increasing: $f'(x) > 0$
 - ③ Decreasing: $f'(x) < 0$
 - ④ Relative Max
 - ⑤ Relative Min
 - ⑥ Concave Up: $f''(x) > 0$
 - ⑦ Concave Down: $f''(x) < 0$
 - ⑧ Inflection Pt(s):
- First Derivative Test
- Change in concavity

Ex 1:

① Critical #(s)

$x = 0$

② Increasing Interval(s)

$(0, \infty)$

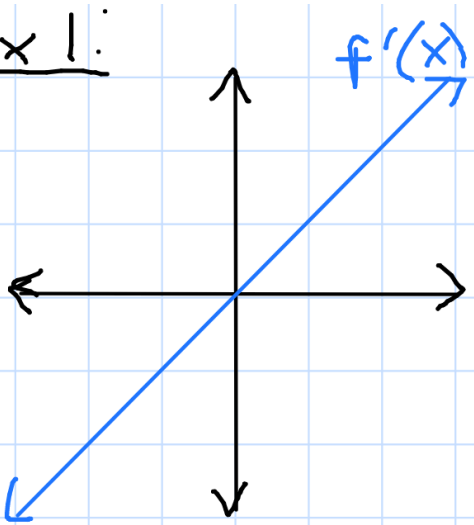
③ Decreasing Interval(s)

$(-\infty, 0)$

④ Relative Max

None

⑤ Relative Min

 $x = 0$ by 1st derivative testEx 1:

⑥ Concave up

$(-\infty, \infty)$

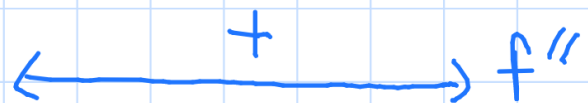
⑦ Concave Down

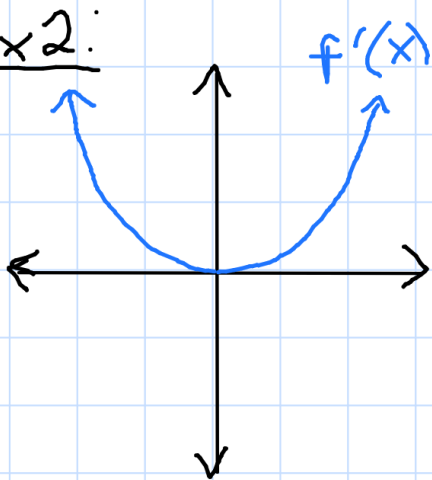
None

⑧ Inflection Pt(s)

None

⑥ b/c $f'(x)$
has a positive
slope



Ex 2:

① Critical #(s)

$x = 0$

② Increasing Interval(s)

$(-\infty, \infty)$

③ Decreasing Interval(s)

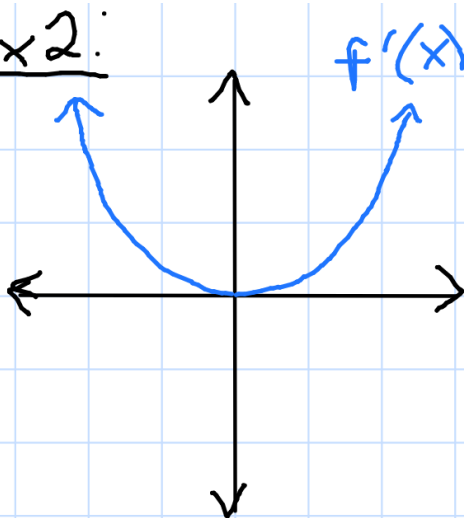
None

④ Relative Max

None

⑤ Relative Min

None

Ex 2:

⑥ Concave up

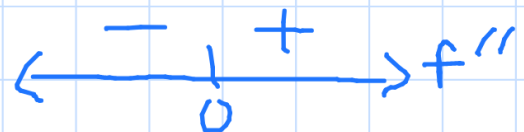
$(0, \infty)$

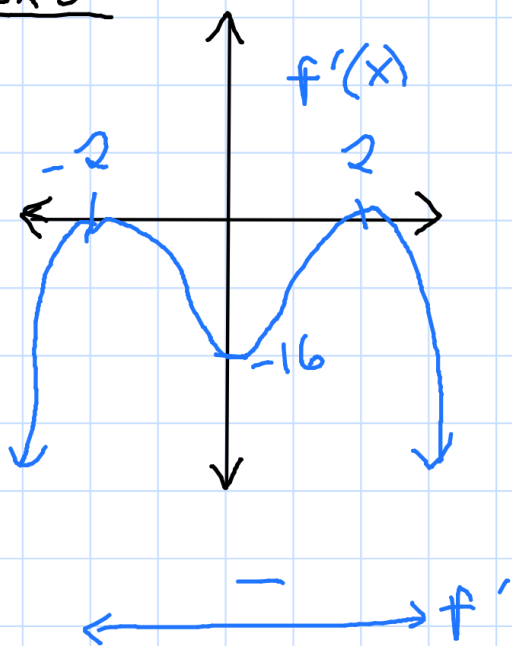
⑦ Concave Down

$(-\infty, 0)$

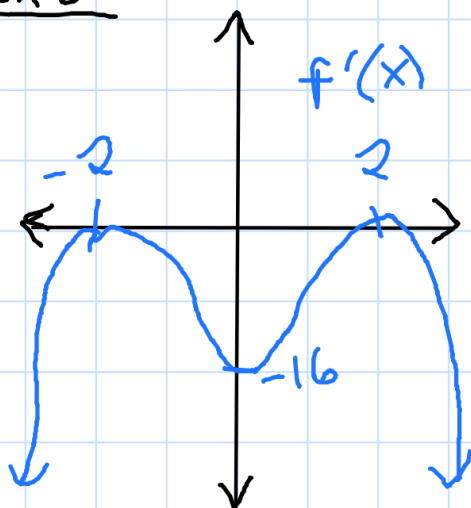
⑧ Inflection Pt(s)

$x = 0$



Ex 3:

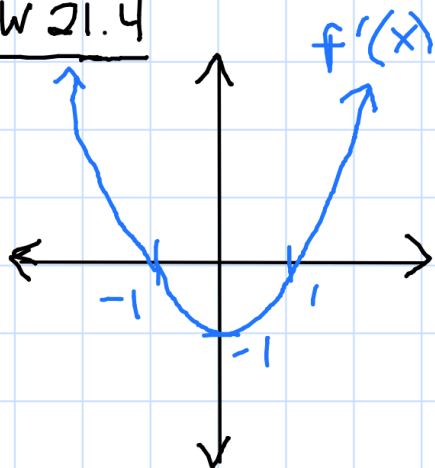
- ① Critical #(s)
 $x = -2, 2$
- ② Increasing Interval(s)
None
- ③ Decreasing Interval(s)
 $(-\infty, \infty)$
- ④ Relative Max
None
- ⑤ Relative Min
None

Ex 3:

- ⑥ Concave Up
 $(-\infty, -2) \cup (0, 2)$
- ⑦ Concave Down
 $(-2, 0) \cup (2, \infty)$
- ⑧ Inflection Pt(s)
 $x = -2, 0, 2$



HW 21.4



① Critical #(s)

$$x = -1, 1$$

② Increasing Interval(s)

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

③ Decreasing Interval(s)

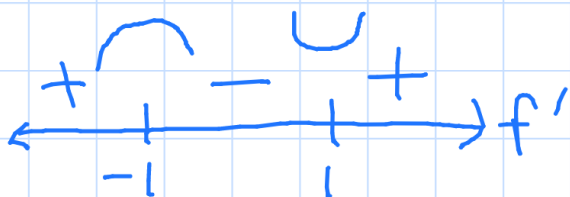
$$(-1, 1)$$

④ Relative Max

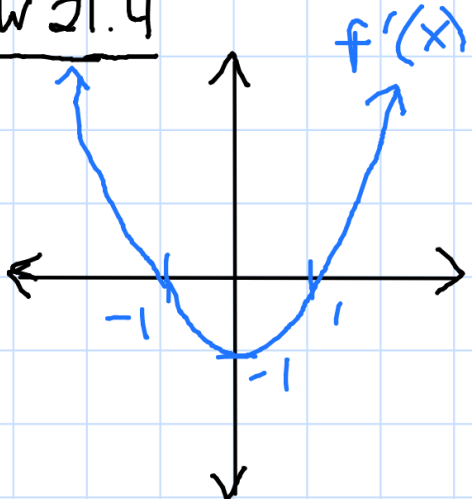
$$x = -1$$

⑤ Relative Min

$$x = 1$$



HW 21.4



⑥ Concave up

$$(0, \infty)$$

⑦ Concave Down

$$(-\infty, 0)$$

⑧ Inflection Pt(s)

$$x = 0$$



- Summary: When given the graph of f' ,
- ① Critical #(s) where the graph touches/crosses the x-axis
 - ② Increasing Interval(s) where the graph is above the x-axis
 - ③ Decreasing Interval(s) where the graph is below the x-axis
 - ④ Relative Max } Draw a # line with ② & ③ and
 - ⑤ Relative Min } use 1st Derivative Test
 - ⑥ Concave up where the slope of f' is positive
 - ⑦ Concave Down where the slope of f' is negative
 - ⑧ Inflection Pt(s) Draw a # line with ⑥ & ⑦ and check for changes in signs