SP26_MA16010_L20_Handout

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SP26_MA16010_L20_...

MA 16010 LESSONS 20 GRAPHICAL INTERPRETATION OF DERIVATIVES

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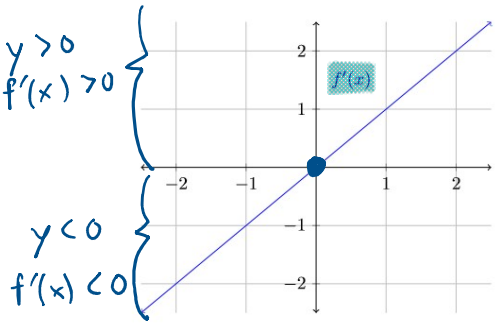
So far, we have learned that:

x-value	**1. Critical Point/Number:**	x-values where $f'(x) = 0$ or $f'(x)$ DNE
interval	**2. Increasing:**	$f'(x) > 0$
interval	**3. Decreasing:**	$f'(x) < 0$
x-value	**4. Relative Max:**	Create # line from (2) and (3), and then use First Derivative Test
x-value	**5. Relative Min:**	
interval	**6. Concave Up:**	$f''(x) > 0$
interval	**7. Concave Down:**	$f''(x) < 0$
x-value	**8. Inflection Point:**	Check for change of concavity from results of (6) and (7)

1. Given the graph of $f'(x)$ below, answer the following question for $f(x)$.



(a) **Critical Number(s):** $f'(x) = 0$

$x = 0$

(b) **Increasing Interval(s):** $f'(x) > 0$

$(0, \infty)$

(c) **Decreasing Interval(s):** $f'(x) < 0$

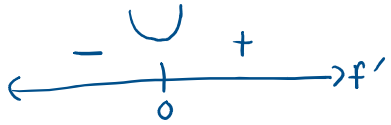
$(-\infty, 0)$

(d) **Relative Maximum Occurs:**

None

(e) **Relative Minimum Occurs:**

$x = 0$



Look @ Slope

(f) **Concave Up Interval(s):**

$(-\infty, \infty)$

(g) **Concave Down Interval(s):**

None

Positive Slope $\Rightarrow f''(x) > 0$

(h) **Inflection Point(s):**

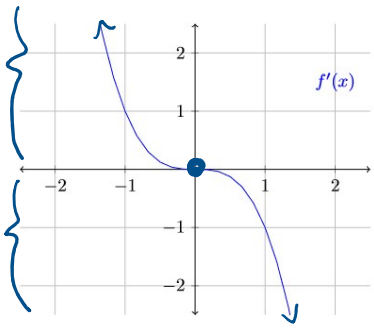
None

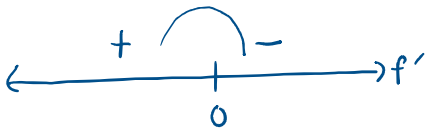
Cont.

2. Given the graph of $f'(x)$ below, answer the following question for $f(x)$.

Inc.

Dec.





Positive Slope ⇒ Concave up

Negative Slope ⇒ Concave down

(a) **Critical Number(s):** $f'(x) = 0$

$x = 0$

(b) **Increasing Interval(s):**

$(-\infty, 0)$

(c) **Decreasing Interval(s):**

$(0, \infty)$

(d) **Relative Maximum Occurs:**

$x = 0$

(e) **Relative Minimum Occurs:**

None

(f) **Concave Up Interval(s):**

None

(g) **Concave Down Interval(s):**

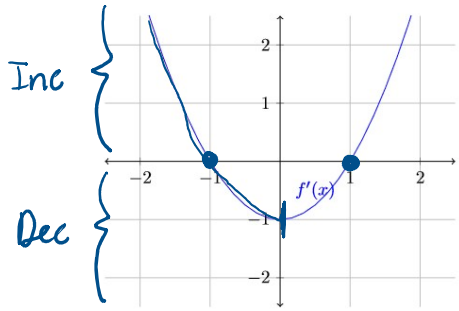
$(-\infty, \infty)$

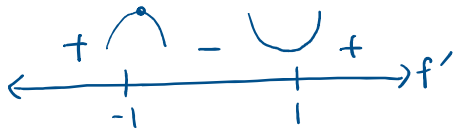
(h) **Inflection Point(s):**

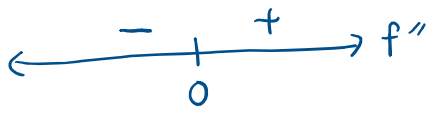
None

Cont.

3. Given the graph of $f'(x)$ below, answer the following question for $f(x)$.







(a) **Critical Number(s):** $f'(x) = 0$

$x = -1, 1$

(b) **Increasing Interval(s):**

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

(c) **Decreasing Interval(s):**

$(-1, 1)$

(d) **Relative Maximum Occurs:**

$x = -1$

(e) **Relative Minimum Occurs:**

$x = 1$

(f) **Concave Up Interval(s):**

$(0, \infty)$

(g) **Concave Down Interval(s):**

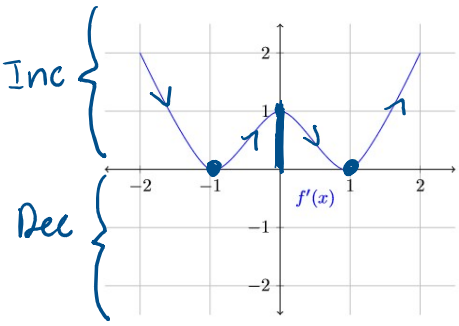
$(-\infty, 0)$

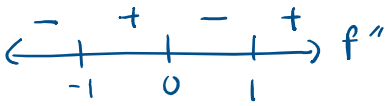
(h) **Inflection Point(s):**

$x = 0$

Cont.

4. Given the graph of $f'(x)$ below, answer the following question for $f(x)$.





(a) **Critical Number(s):**
$x = -1, 1$

(b) **Increasing Interval(s):**
$(-\infty, \infty)$

(c) **Decreasing Interval(s):**
None

(d) **Relative Maximum Occurs:**
None

(e) **Relative Minimum Occurs:**
None

(f) **Concave Up Interval(s):**
$(-1, 0) \cup (1, \infty)$

(g) **Concave Down Interval(s):**
$(-\infty, -1) \cup (0, 1)$

(h) **Inflection Point(s):**
$x = -1, 0, 1$

The End.

Summary: When given the graph of f' ,

1. Critical Point/Number:	Where the graph touches/crosses the x-axis
2. Increasing:	Where the graph is above the x-axis
3. Decreasing:	Where the graph is below the x-axis
4. Relative Max: **5. Relative Min:**	Create # line from (2) and (3), and then use First Derivative Test
6. Concave Up:	Where the slope of f' is positive
7. Concave Down:	Where the slope of f' is negative
8. Inflection Point:	Create a # line with (6) and (7) and check for changes in sign