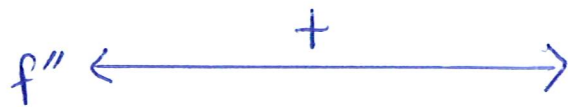
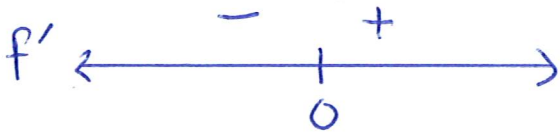
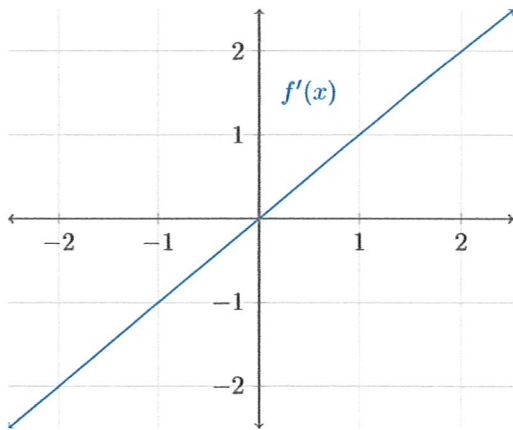


MA 16010 LESSON 17: GRAPHICAL INTERPRETATION OF DERIVATIVES

So far, we have learned that:

x-value	1. Critical Number:	x-values where $f'(x)=0$ or $f'(x)$ DNE
interval	2. Increasing:	$f'(x) > 0$
interval	3. Decreasing:	$f'(x) < 0$
point	4. Relative Max:	<ul style="list-style-type: none"> • Create # line with ② and ③ • Then apply First/Second Derivative Test
point	5. Relative Min:	
interval	6. Concave Up:	$f''(x) > 0$
interval	7. Concave Down:	$f''(x) < 0$
point	8. Inflection Point:	<ul style="list-style-type: none"> • Create # line with ⑥ and ⑦. • Check for change of concavity

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



(a) Critical Number(s):

$$x=0$$

(b) Increasing Interval(s):

$$(0, \infty)$$

(c) Decreasing Interval(s):

$$(-\infty, 0)$$

(d) Relative Maximum Occurs:

None

(e) Relative Minimum Occurs:

$$x=0$$

(f) Concave Up Interval(s):

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

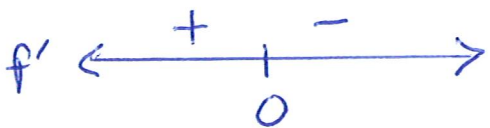
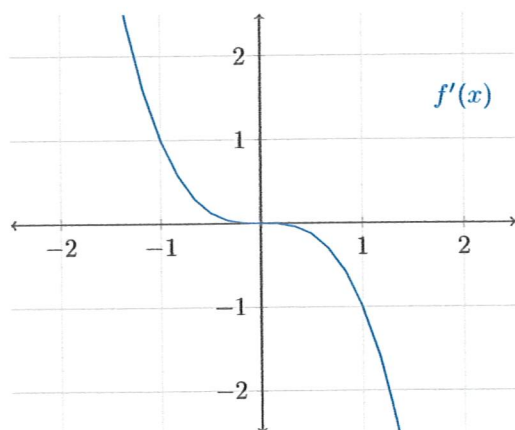
(g) Concave Down Interval(s):

None

(h) Inflection Point(s):

None

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



(a) **Critical Number(s):**

$$x=0$$

(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

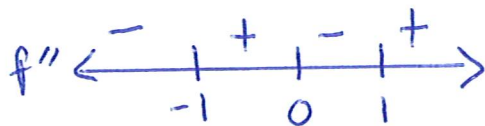
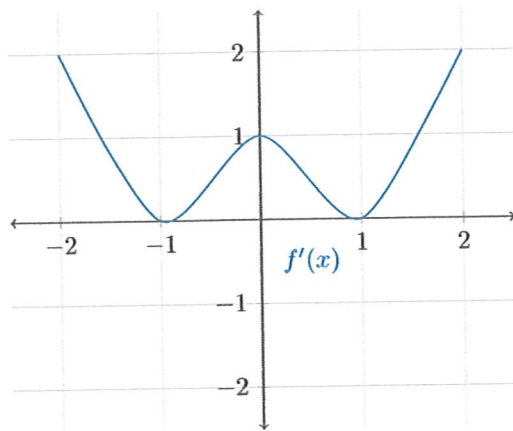
(g) **Concave Down Interval(s):**

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

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

None

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):

$$(-1, 0) \cup (1, \infty)$$

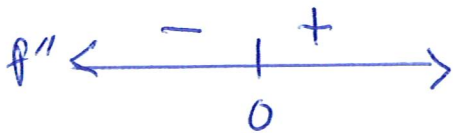
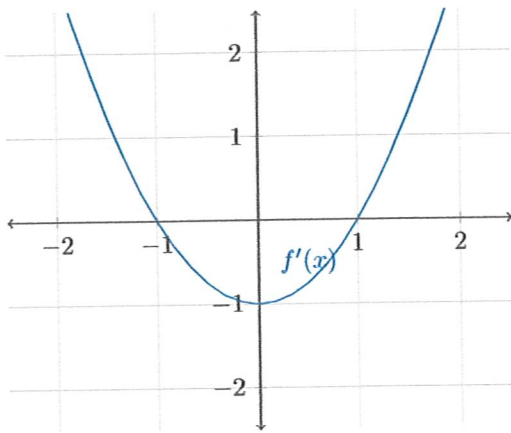
(g) Concave Down Interval(s):

$$(-\infty, -1) \cup (0, 1)$$

(h) Inflection Point(s):

$$x = -1, 0, 1$$

5. 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):

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

(c) Decreasing Interval(s):

$$(-1, 1)$$

(d) Relative Maximum Occurs:

$$x = -1$$

(e) Relative Minimum Occurs:

$$x = 1$$

(f) Concave Up Interval(s):

$$(0, \infty)$$

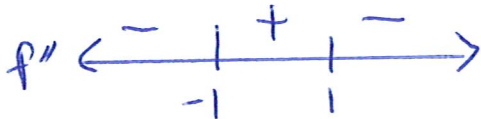
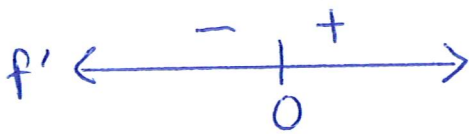
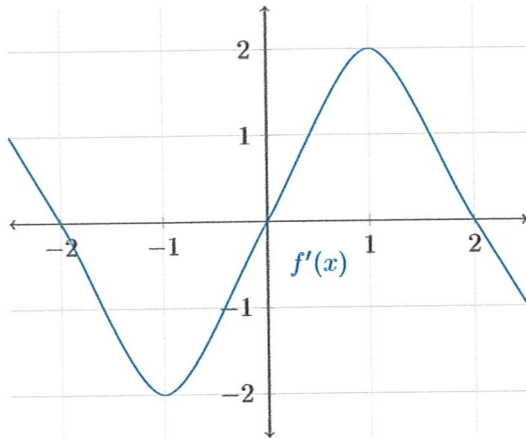
(g) Concave Down Interval(s):

$$(-\infty, 0)$$

(h) Inflection Point(s):

$$x = 0$$

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



(a) **Critical Number(s):**

$$x = -2, 2$$

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

$$(0, \infty)$$

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

$$(-\infty, 0)$$

(d) **Relative Maximum Occurs:**

None

(e) **Relative Minimum Occurs:**

$$x = 0$$

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

$$(-1, 1)$$

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

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

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

$$x = -1, 1$$

Summary: When given the graph of f' ,

1. Critical 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 Occurs:	<ul style="list-style-type: none">• Create # line with ② and ③• Then apply First/Second Derivative Test
5. Relative Min Occurs:	
6. Concave Up:	where the slope of f' is positive
7. Concave Down:	where the slope of f' is negative
8. Inflection Point Occurs:	<ul style="list-style-type: none">• Create # line with ⑥ and ⑦• Check for change in sign