Name _____ Date _____

Pre-AP Calculus Education is Freedom

10.07 – Do Now **Binder Section: DN**

Do Now

1. The function g is given by $g(x) = 4x^3 + 3x^2 - 6x + 1$. What is the absolute minimum value of g on the closed interval $[-2, 1]$?

   (A) -7

   (B) $-\frac{3}{4}$

   (C) 0

   (D) 2

   (E) 6

2. Find the locations of the absolute extrema of $h(x) = \frac{x^2}{x-1}$ on the closed interval $\left[-1, \frac{1}{2}\right]$.

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10.07 – Mad Minute **Binder Section: MM**

Topic: Graphic Analysis
Translations

Take #2

Goal Score: _____ /_____

Actual Score: _____ /_____

Met Goal? Yes / No

Goal for tomorrow: ___/___

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Mad Minute – Graphic Analysis Translations – Take #2

Directions: Fill-in-the-blanks with the correct graphic analysis term.

1. If $f''(x) < 0$, then $f(x)$ is _____	2. If $f'(x) < 0$, then $f(x)$ is _____	3. If $f''(x) > 0$, then $f'(x)$ is _____	4. If $f''(c) = 0$, then $x = c$ could be a _____ _____
5. If $f(x)$ is concave up, then $f''(x)$ is _____	6. If $f(x)$ is increasing, then $f'(x)$ is _____	7. If $f'(c) = 0$ and $f''(c) < 0$, then $x = c$ is a _____ _____	8. If $f''(x) > 0$, then $f(x)$ is _____
9. If $f'(x)$ is decreasing, then $f''(x)$ is _____	10. If $f(x)$ is concave down, then $f'(x)$ is _____	11. If $f'(x)$ is increasing, then $f(x)$ is _____	12. If $f'(x) > 0$, then $f(x)$ is _____
13. If $f'(c) = 0$, then $x = c$ is a _____ _____	14. If $f(x)$ is decreasing, then $f'(x)$ is _____	15. If $f'(c) = 0$ and $f''(c) > 0$, then $x = c$ is a _____ _____	16. If $f'(x)$ is increasing, then $f''(x)$ is _____

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Name _____ Date _____

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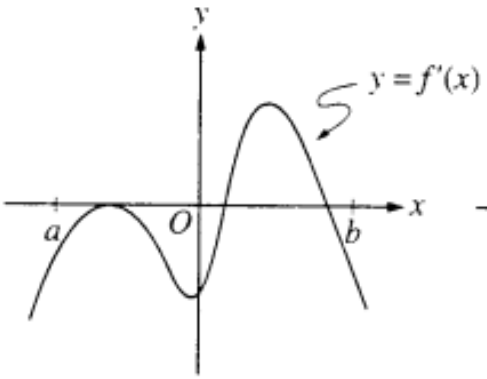
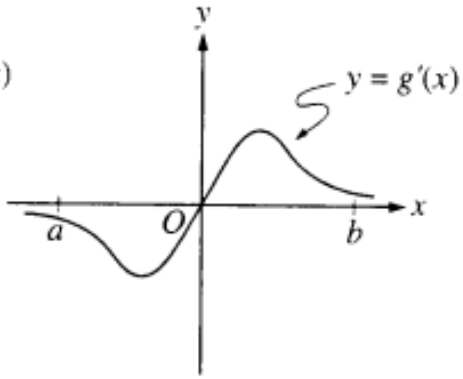
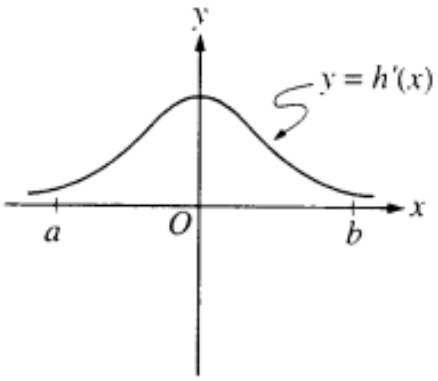
10.07 – Explore **Binder Section: EX**

Explore!







1

1. The graphs of the derivatives of the functions f, g, and h are shown above. Which of the functions f, g, or h have a relative maximum on the open interval $a < x < b$?

   (A) f only
   (B) g only
   (C) h only
   (D) f and g only
   (E) f, g, and h

   Explain your reasoning.

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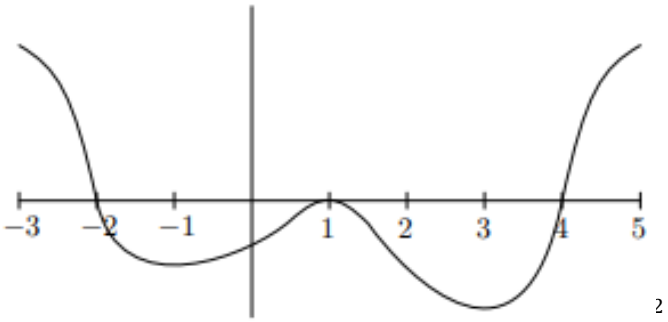
10.07 –Class Notes **Binder Section: CN**

Teacher Note

This is not a student facing notes page. Students should be using their Pre-AP Calculus notebook to capture their "I Do" and "We Do" Example

Example 1



2

1. The figure above shows the graph of f', the derivative of a function f. Identify:

a) The x-values at which f has a relative maximum.

b) The intervals on which f is concave down.

c) The x-values at which the graph of f has a point of inflection.

d) The intervals on which f is increasing.

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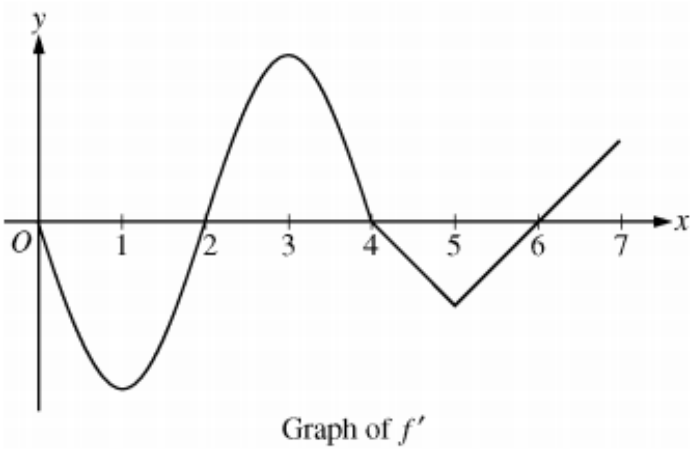
10.07 – Classwork **Binder Section: CW**

Problem Set A

1. The graph of f', the derivative of the function f, is shown to the right. On which of the following intervals is f decreasing?



Graph of f'

(A) $[2, 4]$ only

(B) $[3, 5]$ only

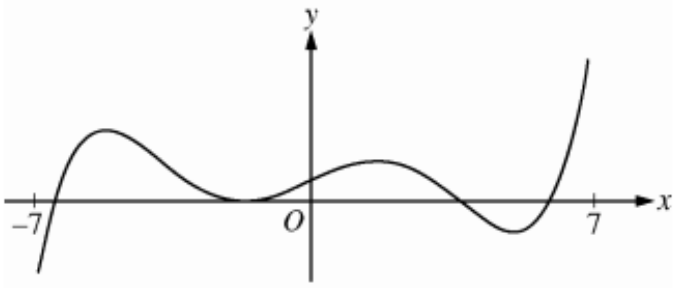
(C) $[0, 1]$ and $[3, 5]$

(D) $[2, 4]$ and $[6, 7]$

(E) $[0, 2]$ and $[4, 6]$

Justify your answer:

2. The figure to the right shows the graph of f', the derivative of the function f, on the open interval $-7 < x < 7$. If f' has four zeros on $-7 < x < 7$, how many relative maxima does f have on $-7 < x < 7$?



Graph of f'

(A) One

(B) Two

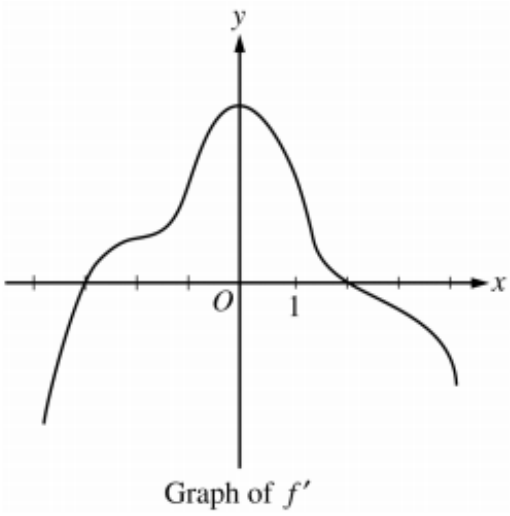
(C) Three

(D) Four

(E) Five

Justify your answer:

Example 2 – AP Multiple Choice!



Graph of f'

1. The graph of f', the derivative of the function f, is shown above. Which of the following statements must be true?

   I. f has a relative minimum at $x = -3$.

   II. The graph of f has a point of inflection at $x = -2$.

   III. The graph of f is concave down for $0 < x < 4$.

   (A) I only
   (B) II only
   (C) III only
   (D) I and II only
   (E) I and III only

Name _____ Seat # _____ Date _____

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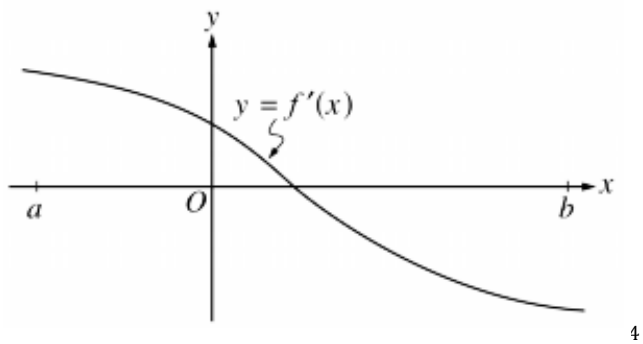
10.07 – Classwork **Binder Section: CW**

Problem Set B



4

1. The graph of f', the derivative of the function f, is shown in the figure above. Which of the following statements must be true?

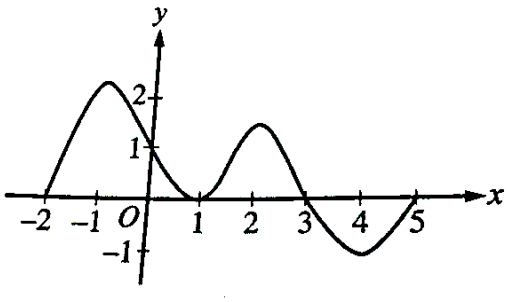
   I. f is continuous on the open interval (a, b).

   II. f is decreasing on the open interval (a, b).

   III. The graph of f is concave down on the open interval (a, b).

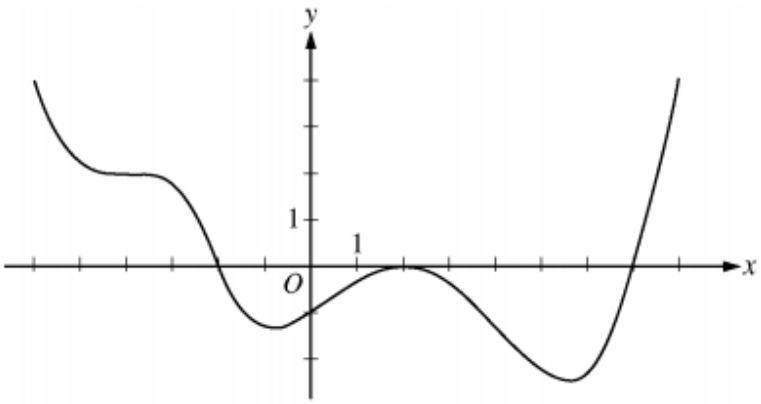
   (A) I only
   (B) I and II only
   (C) I and III only
   (D) II and III only

2. The graph of f', the derivative of a function f, is shown to the right. The domain of f is the closed interval $-2 \leq x \leq 5$. Which of the following statements is true?



Graph of f'

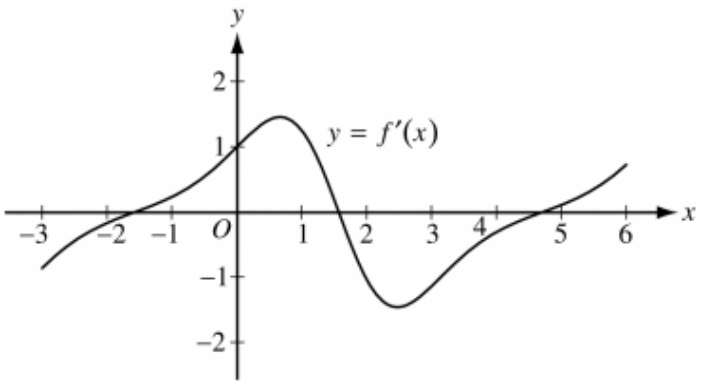
   (A) $f(x)$ is decreasing over $(2, 4)$.
   (B) $f(x)$ is increasing over $(4, 5)$.
   (C) $f(x)$ is increasing over $(1, 3)$.
   (D) $f(x)$ has a local maximum at $x = 2$.
   (E) $f(x)$ has two local extrema on $(-2, 5)$.



Graph of f'

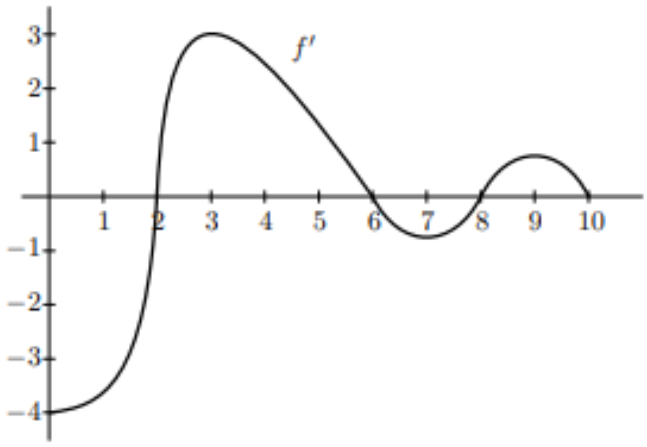
3. The figure above shows the graph of f', the derivative of the function f, for $-6 < x < 8$. Of the following, which best describes the graph of f on the same interval?

(A) 1 relative minimum, 1 relative maximum, and 3 points of inflection
(B) 1 relative minimum, 1 relative maximum, and 4 points of inflection
(C) 2 relative minima, 1 relative maximum, and 2 points of inflection
(D) 2 relative minima, 1 relative maximum, and 4 points of inflection
(E) 2 relative minima, 2 relative maxima, and 3 points of inflection



4. The figure above shows the graph of f', the derivative of the function f, on the interval $[-3, 6]$. If the derivative of the function h is given by $h'(x) = 2f'(x)$, how many points of inflection does the graph of h have on the interval $[-3, 6]$?

(A) One
(B) Two
(C) Three
(D) Four
(E) Five



5. The graph above is the graph of the derivative of a function f. Use the graph to answer each of the following questions about f on the interval $(0, 10)$. Justify each answer with 1 sentence.

   a) On what interval(s) is f increasing?

   b) On what interval(s) is f decreasing?

   c) On what interval(s) is f concave up?

   d) On what interval(s) is f concave down?

   e) Find the x-coordinates of all relative minima of f.

   f) Find the x-coordinates of all relative maxima of f.

   g) Find the x-coordinates of all points of inflection of f.

   h) At what value(s) of x is $f''(x)$ undefined?

Fast Workers! Nice Job working through Problem Set A and Problem Set B. Keep the math fresh by working through these spiral problems below.

AP Open-Ended!

- **Each set of spiraled questions this week will be an actual AP open-ended problem from an old exam. Solve with a partner, then check with the scoring guide to see what score you achieved!**

1. Let f be the function given by $f(x) = x^3 - 5x^2 + 3x + k$, where k is a constant.

   a) On what intervals is f increasing?

   b) On what intervals is the graph of f concave downward?

   c) Find the value of k for which f has 11 as its relative minimum.

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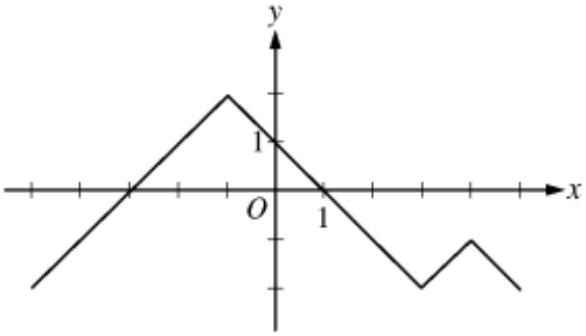
10.07 – Exit Ticket **Binder Section: ET**



Graph of f'

5

A. The graph of f', the derivative of f, is shown in the figure above.

1. The function f has a local maximum at $x =$

(A) -3

(B) -1

(C) 1

(D) 3

(E) 4

2. How many points of inflection does the graph of f have?

(A) 0

(B) 1

(C) 2

(D) 3

(E) 4

3. On what interval(s) is f both increasing and concave down? Justify your answer.

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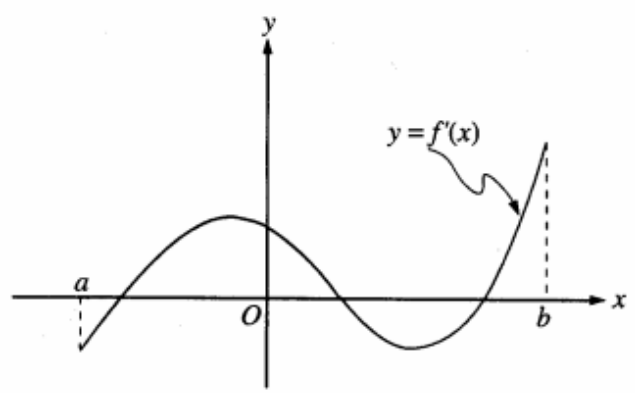
Name _____ Seat # _____ Date _____

Pre-AP Calculus Education is Freedom

10.07 – Homework **Binder Section: HW**

Part I: New Material – Analyzing the Graph of $f'(x)$

1. The graph of f', the derivative of f, is shown in the figure to the right. Which of the following describes all relative extrema of f on the open interval (a, b)?



6

(A) One relative maximum and two relative minima

(B) Two relative maxima and one relative minimum

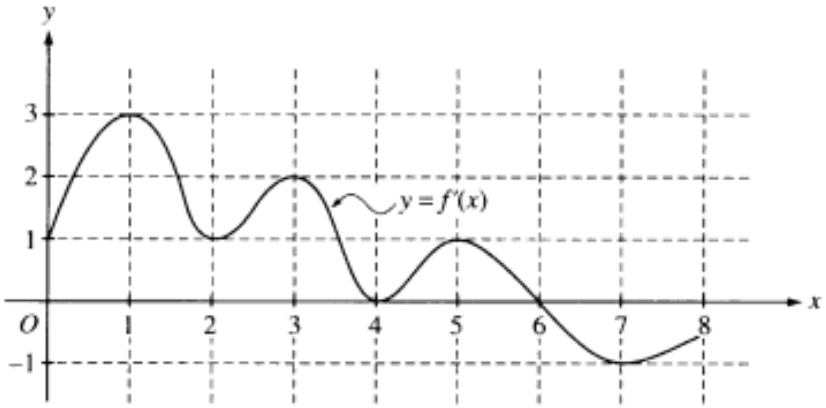
(C) Three relative maxima and one relative minimum

(D) One relative maximum and three relative minima

(E) One relative maximum and one relative minimum

Justify your answer.

2. The function f is defined on the closed interval $[0, 8]$. The graph of its derivative f' is shown to the right. How many points of inflection does the graph of f have?



(A) Two

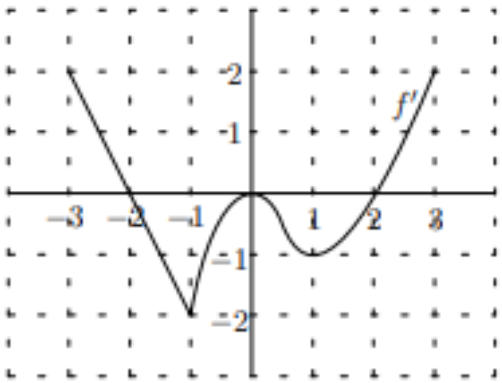
(B) Three

(C) Four

(D) Five

(E) Six

Justify your answer.



3. The graph of $f'(x)$, the derivative of $f(x)$, is shown above. The domain of f is the interval $-3 \le x \le 3$. Which of the following is true about the graph of f?

I. f is increasing on $(-3, -2)$.

II. f is concave down on $(-3, -1)$.

III. The maximum value of $f(x)$ on $(-3, 2)$ is $f(-3)$.

(A) I only
(B) II only
(C) III only
(D) I and II only
(E) II and III only

Part II: Spiral Material – keep the math fresh!

4. Let f be the function defined by $f(x) = 2x^3 - 3x^2 - 12x + 18$. On which of the following intervals is the graph of f <u>both</u> decreasing and concave up?

(A) $(-\infty, -1)$
(B) $\left(-1, \frac{1}{2}\right)$
(C) $(-1, 2)$
(D) $\left(\frac{1}{2}, 2\right)$
(E) $(2, \infty)$

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