MVT Wrap Up

Name

1.

x	10	11	12	13	14
$f(x)$	5	2	3	6	5

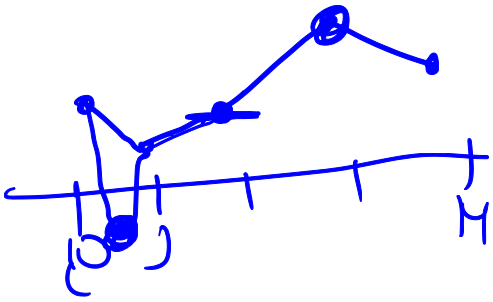
The table above gives values of the continuous function f at selected values of x. If f has exactly two critical points on the open interval (10, 14), which of the following must be true?

(A) f(x) > 0 for all x in the open interval (10, 14).

(B) f'(x) exists for all x in the open interval (10, 14).

(C) f'(x) < 0 for all x in the open interval (10, 11).

(D) $f'(12) \neq 0$



2. Which of the following functions of x is guaranteed by the Extreme Value Theorem to have an absolute maximum on the interval $[0, 4]$?

(A) $y = \tan x$

(B) $y = \tan^{-1} x$

(C) $y = \frac{x^2-16}{x^2+x-20}$

(D) $y = \frac{1}{x^2-1}$

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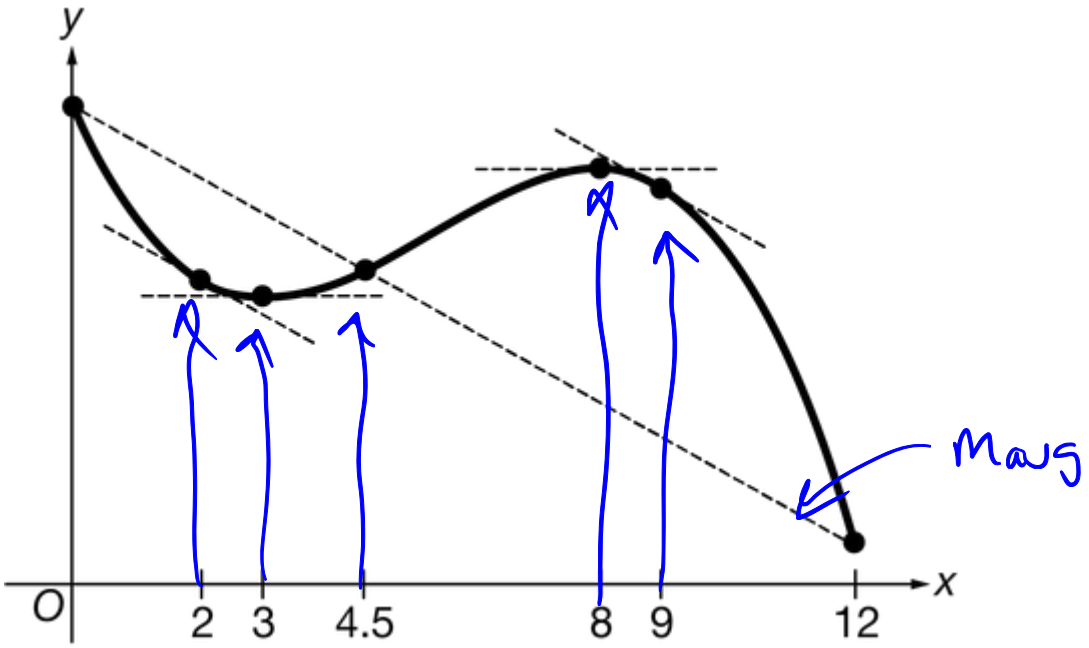
3.



The function f shown in the figure above is continuous on the closed interval $[0, 12]$ and differentiable on the open interval $(0, 12)$. Based on the graph, what are all values of x that satisfy the conclusion of the Mean Value Theorem applied to f on the closed interval $[0, 12]$?

(A) 4.5 only because this is the value where $f(x)$ equals the average rate of change of f on $[0, 12]$.

(B) 3 and 8 because these are the values where $f'(x) = 0$ on $[0, 12]$.

(C) 2 and 9 only because these are the values where the instantaneous rate of change of f at those values is equal to the average rate of change of f on $[0, 12]$.

(D) 2, 4.5, and 9 because these are the values where either the instantaneous rate of change of f at the value is equal to the average rate of change of f on $[0, 12]$ or the value of $f(x)$ is equal to the average rate of change of f on $[0, 12]$.

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4. The Mean Value Theorem can be applied to which of the following functions on the closed interval $[-3, 3]$?

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(A) $f(x) = x^{\frac{2}{3}}$ not differentiable

(B) $f(x) = |x - 1|$ not diff.

(C) $f(x) = \frac{x-2}{x-5}$ good

(D) $f(x) = \frac{x-5}{x-2}$ not cont.

5.

x	0	4	8	12	16
$f(x)$	8	0	2	10	1

The table above gives selected values for the differentiable function f. In which of the following intervals must there be a number c such that $f'(c) = 2$?

(A) $(0, 4)$

(B) $(4, 8)$

(C) $(8, 12)$

(D) $(12, 16)$

$\frac{\Delta y}{\Delta x} = 2 = \frac{f(12) - f(8)}{12 - 8} = \frac{10 - 2}{4} = \frac{8}{4}$

by MVT

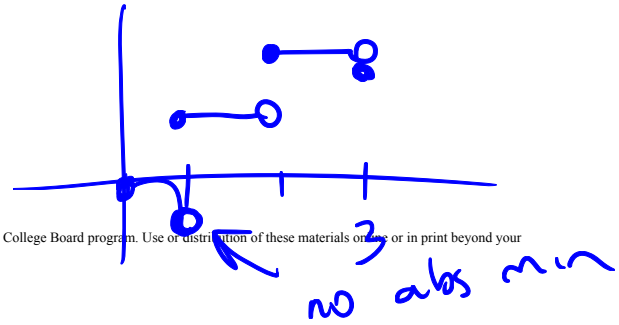
6.

x	0	1	2	3
$f(x)$	0	4	7	6

→ don't have continuity or differentiability.

Let f be a function with selected values given in the table above. Which of the following statements must be true?

1. By the Intermediate Value Theorem, there is a value c in the interval $(0, 3)$ such that $f(c) = 2$.
2. By the Mean Value Theorem, there is a value c in the interval $(0, 3)$ such that $f'(c) = 2$.
3. By the Extreme Value Theorem, there is a value c in the interval $[0, 3]$ such that $f(c) \leq f(x)$ for all x in the interval $[0, 3]$.



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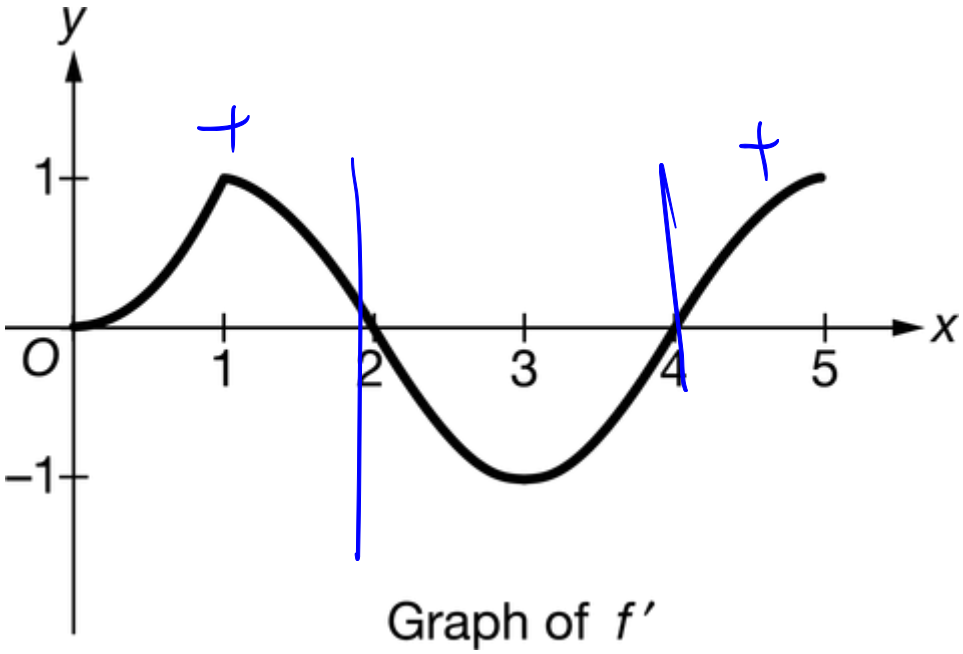
(A) None

(B) I only

(C) II only

(D) I, II, and III

7.



Graph of f'

The function f is continuous on the closed interval $[0, 5]$. The graph of f', the derivative of f, is shown above. On which of the following intervals is f increasing?

where is f' so

(A) $[0, 1]$ and $[2, 4]$

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

(C) $[0, 1]$ and $[4, 5]$ only

(D) $[0, 2]$ and $[4, 5]$

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