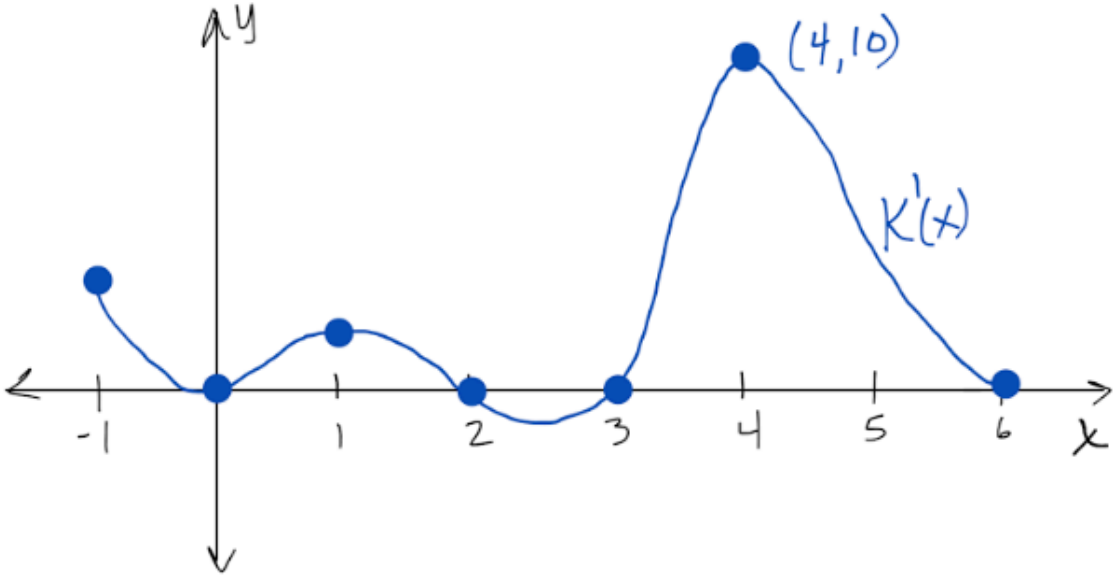
Name_____ Date_____ Seasonal Spice_____

AB Calculus Test: 3.1-3.5 No Calculator

Part I: Multiple Choice—Put the CAPITAL letter in the space to the left of each question number.




Use the graph above for questions 1 – 4. Let $k$ be a function that is differentiable on the interval $[-1,6]$. The graph of the continuous function $k'(x)$, the derivative of $k$, is given above. The graph of $k'(x)$ has $x$-intercepts at $x=0$, $x=2$, $x=3$, and $x=6$.

_____ 1. At what value of $x$ can the absolute maximum of $k$ occur?

(A) $-1$ (B) 3 (C) 4 (D) 5 (E) 6

_____ 2. How many local extrema does the graph of $k$ have on the interval $[-1,6]$?

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

_____ 3. How many inflection values does the graph of $k$ have on the interval $[-1,6]$?

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

_____ 4. How many values of $x$ satisfy the Mean Value Theorem for the function $k'(x)$ on the interval $[-1,6]$?

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

_____ 5. If $f(x)$ is a differentiable function such that $f(10)=29$ and $f'(x)\le 3$ for all $x$, what is the smallest possible value of $f(-1)$?

(A) 62 (B) 33 (C) 3 (D) $-4$ (E) $-33$

_____ 6. Use the EVT to find the range of the function $f(x)=2x^3+3x^2-12x-1$ on the interval $-1\le x\le 2$.

(A) $y\in[-8,12]$ (B) $y\in[-8,3]$ (C) $y\in[3,12]$ (D) $y\in[-8,19]$ (E) $y\in[3,19]$

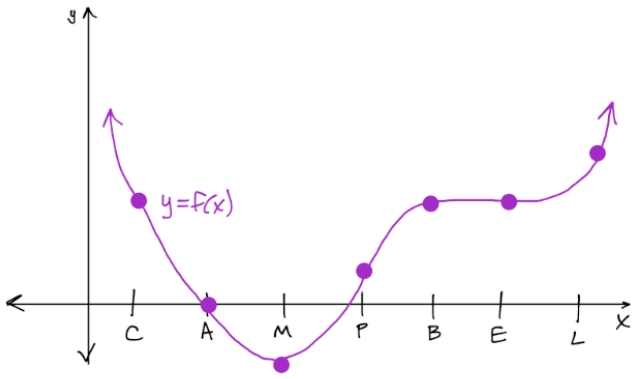
_____ 7. If $M'(x)=x^2(x-4)^3(2x+1)^{-4/3}$ for some continuous function $M$, then $M$ has which of the following?

I. Local minimum at $x=0$

II. Local maximum at $x=-\frac{1}{2}$

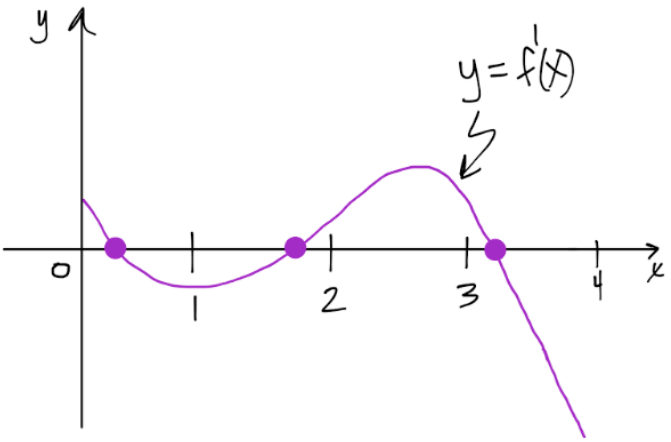
III. Local minimum at $x=4$

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



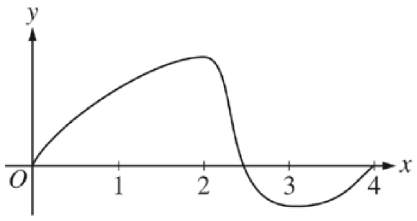

_____ 8. The function $f$ is shown above with dots corresponding to the marked locations, $C$, $A$, $M$, $P$, $B$, $E$, and $L$. Of the following, which has the LARGEST value?

(A) $f'(C)$ (B) $f''(B)$ (C) $f'(M)$ (D) $f''(L)$ (E) $f(A)$

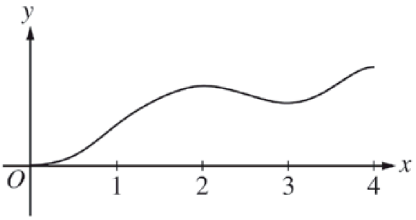



_____ 9. The figure above shows the graph of $f'$, the derivative of the function $f$. If $f(0)=0$, which of the following could be the graph of $f$?

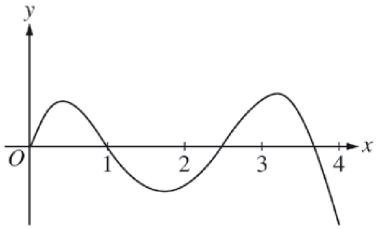
(A)



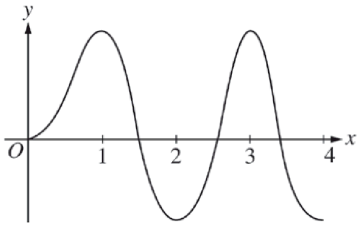

(B)



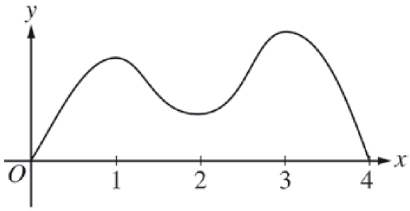

(C)




(D)




(E)




_____ 10. Selected information is given below about a continuous function $f(x)$ that is continuous for all real numbers.

| | $x<-2$ | $x=-2$ | $-2<x<1$ | $x=1$ |
|---|---|---|---|---|
| $f(x)$ | positive | 3 | negative | 0 |
| $f'(x)$ | positive | 0 | negative | –4 |
| $f''(x)$ | positive | 42 | negative | 0 |

Which of the following must be true about the function $f(x)$

I. $f(x)$ has a local minimum of 3

II. $f(x)$ has a local maximum at $-2$

III. $f(x)$ has an inflection value at 1

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

Part II: AB Free Response—Show all work in the space provided. Use proper notation (always).

Suppose $f$ is a function given by $f(x) = 6x^{2/3} - 3x^{4/3}$,

(a) Show that $f'(x) = \dfrac{4\left(1 - \sqrt[3]{x^2}\right)}{\sqrt[3]{x}}$.

(b) Determine the $x$-coordinates of any local max/ local mins of $f(x)$? Justify your answer using the 1st Derivative Test.

(c) Determine the intervals on which $f(x)$ is concave down. Justify.