

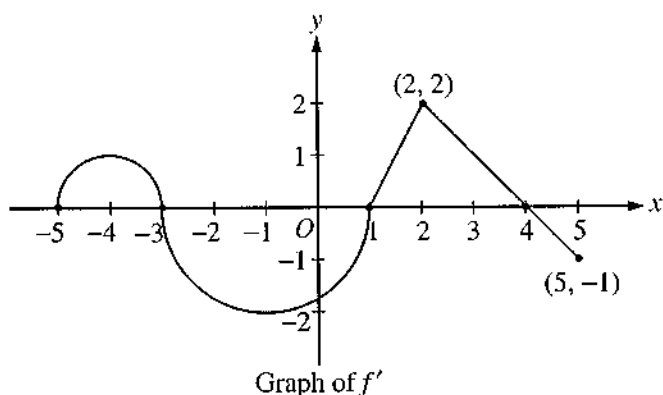
2007 AP[®] CALCULUS AB FREE-RESPONSE QUESTIONS (Form B)

**CALCULUS AB
SECTION II, Part B**

Time—45 minutes

Number of problems—3

No calculator is allowed for these problems.



4. Let f be a function defined on the closed interval $-5 \leq x \leq 5$ with $f(1) = 3$. The graph of f' , the derivative of f , consists of two semicircles and two line segments, as shown above.
- (a) For $-5 < x < 5$, find all values x at which f has a relative maximum. Justify your answer.
 - (b) For $-5 < x < 5$, find all values x at which the graph of f has a point of inflection. Justify your answer.
 - (c) Find all intervals on which the graph of f is concave up and also has positive slope. Explain your reasoning.
 - (d) Find the absolute minimum value of $f(x)$ over the closed interval $-5 \leq x \leq 5$. Explain your reasoning.

WRITE ALL WORK IN THE EXAM BOOKLET.

2005 AP[®] CALCULUS AB FREE-RESPONSE QUESTIONS**CALCULUS AB
SECTION II, Part B**

Time—45 minutes

Number of problems—3

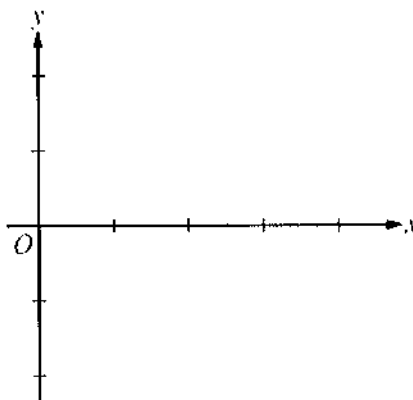
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x	0	$0 < x < 1$	1	$1 < x < 2$	2	$2 < x < 3$	3	$3 < x < 4$
$f(x)$	-1	Negative	0	Positive	2	Positive	0	Negative
$f'(x)$	4	Positive	0	Positive	DNE	Negative	-3	Negative
$f''(x)$	-2	Negative	0	Positive	DNE	Negative	0	Positive

4. Let f be a function that is continuous on the interval $[0, 4]$. The function f is twice differentiable except at $x = 2$. The function f and its derivatives have the properties indicated in the table above, where DNE indicates that the derivatives of f do not exist at $x = 2$.

- (a) For $0 < x < 4$, find all values of x at which f has a relative extremum. Determine whether f has a relative maximum or a relative minimum at each of these values. Justify your answer.
- (b) On the axes provided, sketch the graph of a function that has all the characteristics of f .

(Note: Use the axes provided in the pink test booklet.)



- (c) Let g be the function defined by $g(x) = \int_1^x f(t) dt$ on the open interval $(0, 4)$. For $0 < x < 4$, find all values of x at which g has a relative extremum. Determine whether g has a relative maximum or a relative minimum at each of these values. Justify your answer.
- (d) For the function g defined in part (c), find all values of x , for $0 < x < 4$, at which the graph of g has a point of inflection. Justify your answer.
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WRITE ALL WORK IN THE TEST BOOKLET.

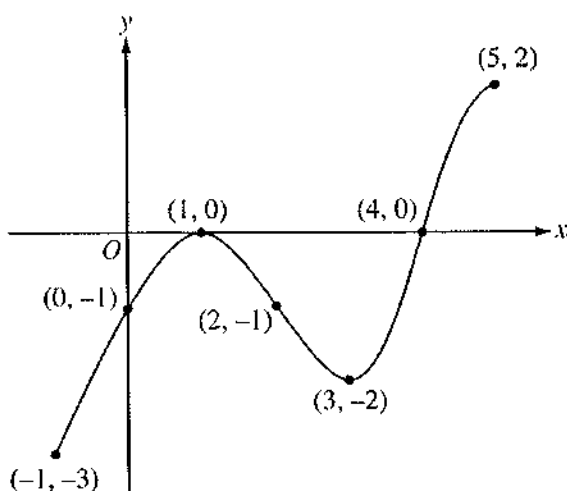
2004 AP[®] CALCULUS AB FREE-RESPONSE QUESTIONS (Form B)

CALCULUS AB
SECTION II, Part B

Time—45 minutes

Number of problems—3

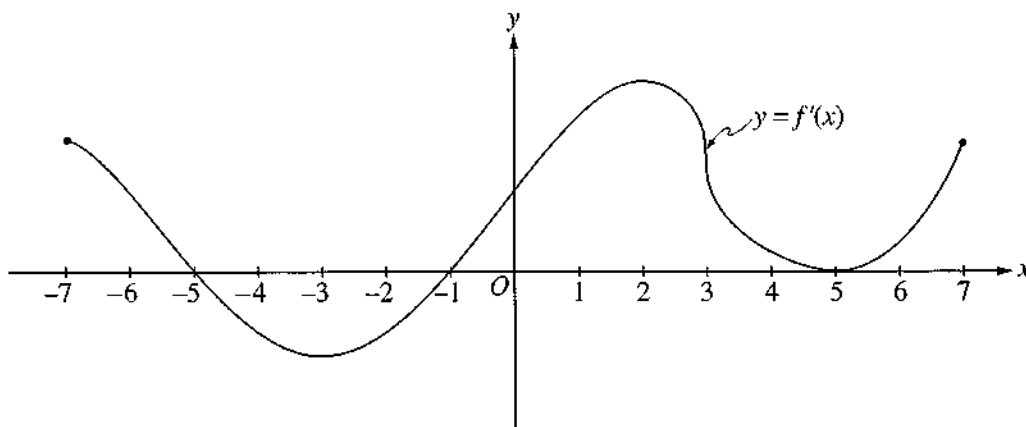
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Graph of f'

4. The figure above shows the graph of f' , the derivative of the function f , on the closed interval $-1 \leq x \leq 5$. The graph of f' has horizontal tangent lines at $x = 1$ and $x = 3$. The function f is twice differentiable with $f(2) = 6$.
- (a) Find the x -coordinate of each of the points of inflection of the graph of f . Give a reason for your answer.
- (b) At what value of x does f attain its absolute minimum value on the closed interval $-1 \leq x \leq 5$? At what value of x does f attain its absolute maximum value on the closed interval $-1 \leq x \leq 5$? Show the analysis that leads to your answers.
- (c) Let g be the function defined by $g(x) = xf(x)$. Find an equation for the line tangent to the graph of g at $x = 2$.

2000 AP® CALCULUS AB FREE-RESPONSE QUESTIONS



3. The figure above shows the graph of f' , the derivative of the function f , for $-7 \leq x \leq 7$. The graph of f' has horizontal tangent lines at $x = -3$, $x = 2$, and $x = 5$, and a vertical tangent line at $x = 3$.
- (a) Find all values of x , for $-7 < x < 7$, at which f attains a relative minimum. Justify your answer.
- (b) Find all values of x , for $-7 < x < 7$, at which f attains a relative maximum. Justify your answer.
- (c) Find all values of x , for $-7 < x < 7$, at which $f''(x) < 0$.
- (d) At what value of x , for $-7 \leq x \leq 7$, does f attain its absolute maximum? Justify your answer.
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END OF PART A OF SECTION II