

2010 AP Calculus AB FRQ (Form B) Question 2

Calculator - In Class

The function g is defined for $x > 0$ with $g(1) = 2$, $g'(x) = \sin\left(x + \frac{1}{x}\right)$, and $g''(x) = \left(1 - \frac{1}{x^2}\right)\cos\left(x + \frac{1}{x}\right)$.

- Find all values of x in the interval $0.12 \leq x \leq 1$ at which the graph of g has a horizontal tangent line.
- On what subintervals of $(0.12, 1)$, if any, is the graph of g concave down? Justify your answer.
- Write an equation for the line tangent to the graph of g at $x = 0.3$.
- Does the line tangent to the graph of g at $x = 0.3$ lie above or below the graph of g for $0.3 < x < 1$? Why?

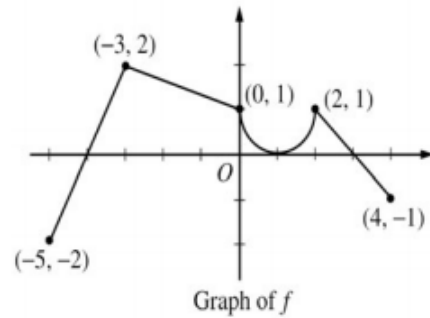
2004 AP Calculus AB FRQ (Form A) Question 4

No Calculator - In Class

The graph of the function f shown above consists of a semicircle and three line segments. Let g be the function

given by $g(x) = \int_{-3}^x f(t) dt$.

- (a) Find $g(0)$ and $g'(0)$.
- (b) Find all values of x in the open interval $(-5, 4)$ at which g attains a relative maximum. Justify your answer.
- (c) Find the absolute minimum value of g on the closed interval $[-5, 4]$. Justify your answer.
- (d) Find all values of x in the open interval $(-5, 4)$ at which the graph of g has a point of inflection.



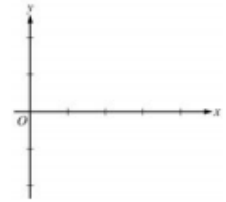
2005 AP Calculus AB FRQ (Form A) Question 4

No Calculator - HW Not Timed

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

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.

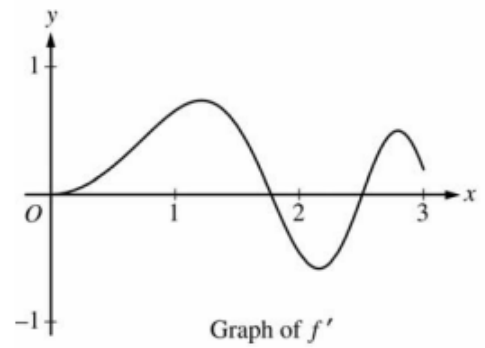


2006 AP Calculus AB FRQ (Form B) Question 2

Calculator - HW Timed 15 minutes

Let f be the function defined for $x \geq 0$ with $f(0) = 5$ and f' , the first derivative of f , given by $f'(x) = e^{(-x/4)} \sin(x^2)$. The graph of $y = f'(x)$ is shown above.

- Use the graph of f' to determine whether the graph of f is concave up, concave down, or neither on the interval $1.7 < x < 1.9$. Explain your reasoning.
- On the interval $0 \leq x \leq 3$, find the value of x at which f has an absolute maximum. Justify your answer.
- Write an equation for the line tangent to the graph of f at $x = 2$.



2005 AP Calculus AB FRQ (Form B) Question 4

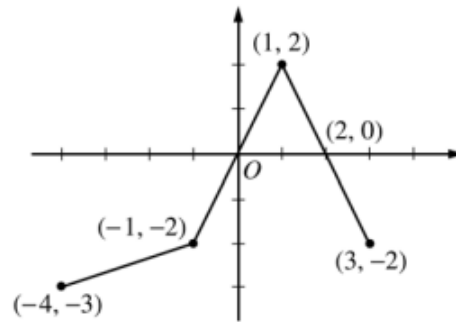
No Calculator - HW Timed 15 minutes

The graph of the function f above consists of three line segments.

- (a) Let g be the function given by $g(x) = \int_{-4}^x f(t) dt$.

For each of $g(-1)$, $g'(-1)$, and $g''(-1)$, find the value or state that it does not exist.

- (b) For the function g defined in part (a), find the x -coordinate of each point of inflection of the graph of g on the open interval $-4 < x < 3$. Explain your reasoning.



Graph of f

- (c) Let h be the function given by $h(x) = \int_x^3 f(t) dt$. Find all values of x in the closed interval

$-4 \leq x \leq 3$ for which $h(x) = 0$.

- (d) For the function h defined in part (c), find all intervals on which h is decreasing. Explain your reasoning.