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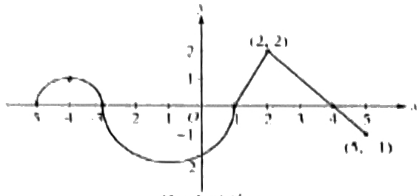
AP Calculus

DATE

FRQ #22

Graph

Let f be a function defined on the closed interval $-5 \le x \le 5$ with $f(1) = 3$. The graph of f', the derivative of f, consists of two semicircles and two line segments, as shown on the graph.



Graph of f'

1. For $-5 < x < 5$, find all values of x at which f has a relative maximum. Justify.

Max occurs when transitioning from + to −. Therefore at $\boxed{x = -3, 4}$

2. For $-5 < x < 5$, find all values of x at which the graph of f has a point of inflection. Justify your answer.

− When $f'' = 0$ or DNE

$\boxed{x = -4, -1, 2 \text{ (DNE)}}$

3. Find all intervals on which the graph of f is concave up and also has a positive slope. Explain your reasoning.

$f'' > 0$ & $f' > 0$

$(-5,-4) \cup (-1,2)$ $\quad$ $(-5,-3) \cup (1,4)$ $\quad$ $\boxed{\therefore (-5,-4) \cup (1,2)}$

4. Find the absolute minimum of f(x) over the closed interval [-5, 5]. Explaining your reasoning.

$f'(x) = 0$, $x = -3, 1, 4$

x	$f(x)$
1	3 (Given)
-5	$3 + \int_1^{-5} f'(x) > 3$
5	$3 + \int_1^{5} f'(x) > 3$

$\boxed{\text{Absolut min at 3 at } x = 1}$