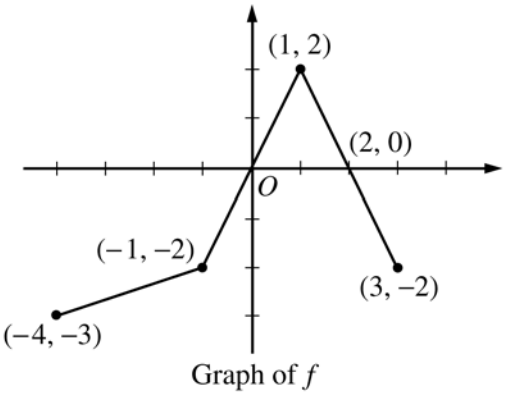
AP® CALCULUS AB
2005 SCORING GUIDELINES (Form B)

Question 4

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



Graph of f

(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.

(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 $-4 \le x \le 3$ 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.

(a) $g(-1) = \int_{-4}^{-1} f(t)\,dt = -\frac{1}{2}(3)(5) = -\frac{15}{2}$
$g'(-1) = f(-1) = -2$
$g''(-1)$ does not exist because f is not differentiable at $x = -1$.

3 : $\begin{cases} 1 : g(-1) \\ 1 : g'(-1) \\ 1 : g''(-1) \end{cases}$

(b) $x = 1$
$g' = f$ changes from increasing to decreasing at $x = 1$.

2 : $\begin{cases} 1 : x = 1 \text{ (only)} \\ 1 : \text{reason} \end{cases}$

(c) $x = -1,\ 1,\ 3$

2 : correct values
$\langle -1 \rangle$ each missing or extra value

(d) h is decreasing on $[0, 2]$
$h' = -f < 0$ when $f > 0$

2 : $\begin{cases} 1 : \text{interval} \\ 1 : \text{reason} \end{cases}$