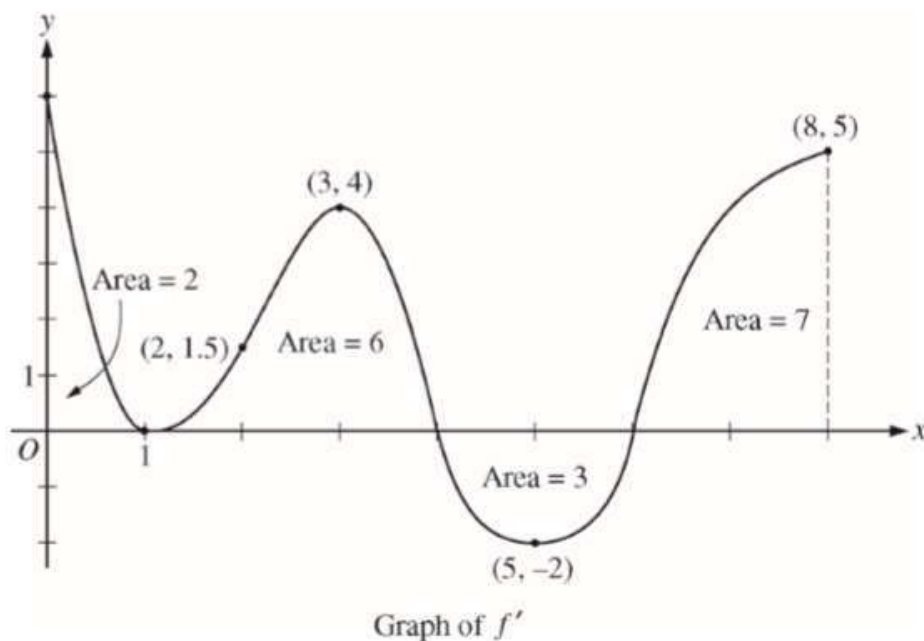


Extrema, Area under curve, tangent line problem given graph of derivative

AP Calculus

Do this free response question on a separate piece of paper and practice showing clear work. Remember: “Justify” means use math and possibly also words to justify. “Explain” means you must use words along with any math you have. Don’t ever use the word “it” and use notation whenever possible such as f or f' rather than words like “function” or “slope”.



The figure above shows the graph of f' , the derivative of a twice-differentiable function f , on the closed interval $0 \leq x \leq 8$. The graph of f' has horizontal tangent lines at $x = 1$, $x = 3$, and $x = 5$. The areas of the regions between the graph of f' and the x -axis are labeled in the figure. The function f is defined for all real numbers and satisfies $f(8) = 4$.

- (a) Find all values of x on the open interval $0 < x < 8$ for which the function f has a local minimum. Justify your answer.
- (b) Determine the absolute minimum value of f on the closed interval $0 \leq x \leq 8$. Justify your answer.
- (c) On what open intervals contained in $0 < x < 8$ is the graph of f both concave down and increasing? Explain your reasoning.
- (d) The function g is defined by $g(x) = (f(x))^3$. If $f(3) = -\frac{5}{2}$, find the slope of the line tangent to the graph of g at $x = 3$.