Show all work that leads to your answers!

1. $\int_2^x (3t^2 - 1)\,dt =$

(A) $x^3 - x - 6$ (B) $x^3 - x$ (C) $3x^2 - 12$ (D) $3x^2 - 1$ (E) $6x - 12$

2. What is the slope of the line tangent to the graph of $y = \ln(2x)$ at the point where $x = 4$?

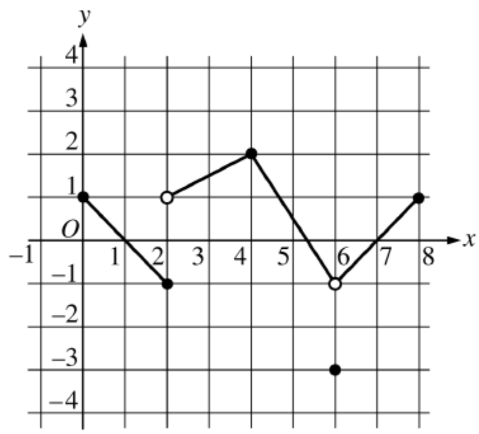
(A) $\frac{1}{8}$ (B) $\frac{1}{4}$ (C) $\frac{1}{2}$ (D) $\frac{3}{4}$ (E) 4

3. If $f(x) = 4x^{-2} + \frac{1}{4}x^2 + 4$, then $f'(2) =$

(A) -62 (B) -58 (C) -3 (D) 0 (E) 1

4. $\int_1^2 \frac{dx}{2x+1} =$

(A) $2\ln 2$ (B) $\frac{1}{2}\ln 2$ (C) $2(\ln 5 - \ln 3)$ (D) $\ln 5 - \ln 3$ (E) $\frac{1}{2}(\ln 5 - \ln 3)$



5. The figure above shows the graph of the function f. Which of the following statements are true?

I. $\lim_{x \to 2^-} f(x) = f(2)$

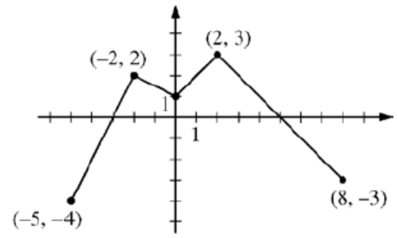
II. $\lim_{x \to 6^-} f(x) = \lim_{x \to 6^+} f(x)$

III. $\lim_{x \to 6} f(x) = f(6)$

(A) II only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

1.

The continuous function f is defined on the interval $-5 \le x \le 8$. The graph of f, which consists of four line segments, is shown in the figure above.



Graph of f

Let g be the function given by $g(x) = 2x + \int_{-2}^{x} f(t)\,dt$.

(a) Find $g(0)$ and $g(-5)$.

(b) Find $g'(x)$ in terms of $f(x)$. For each of $g''(4)$ and $g''(-2)$, find the value or state that it does not exist.

(c) On what intervals, if any, is the graph of g concave down? Give a reason for your answer.

(d) The function h is given by $h(x) = g\left(x^3 + 1\right)$. Find $h'(1)$. Show the work that leads to your answer.