

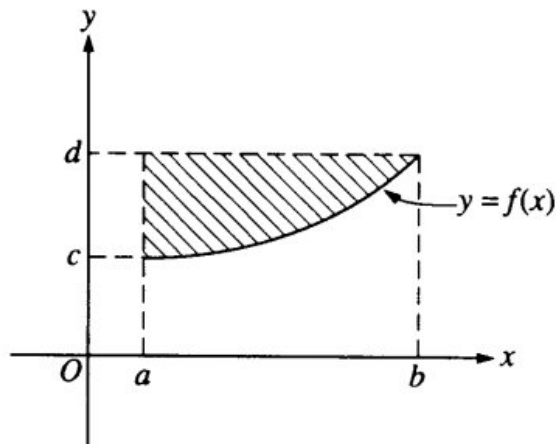
Complete all the following on notebook paper.

_____ 1.

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

- (A) -6 (B) -3 (C) 3 (D) 6 (E) 8

_____ 2.



Which of the following represents the area of the shaded region in the figure above?

- (A) $\int_c^d f(y)dy$ (B) $\int_a^b (d - f(x))dx$ (C) $f'(b) - f'(a)$
 (D) $(b - a)[f(b) - f(a)]$ (E) $(d - c)[f(b) - f(a)]$

_____ 3.

$\lim_{n \rightarrow \infty} \frac{3n^3 - 5n}{n^3 - 2n^2 + 1}$ is

- (A) -5 (B) -2 (C) 1 (D) 3 (E) nonexistent

_____ 4.

If the function f is continuous for all real numbers and if $f(x) = \frac{x^2 - 4}{x + 2}$ when $x \neq -2$, then $f(-2) =$

- (A) -4 (B) -2 (C) -1 (D) 0 (E) 2

_____ 5.

If $x^3 + 3xy + 2y^3 = 17$, then in terms of x and y , $\frac{dy}{dx} =$

(A) $-\frac{x^2 + y}{x + 2y^2}$

(B) $-\frac{x^2 + y}{x + y^2}$

(C) $-\frac{x^2 + y}{x + 2y}$

(D) $-\frac{x^2 + y}{2y^2}$

(E) $\frac{-x^2}{1 + 2y^2}$

_____ 6.

The area of the region enclosed by the curve $y = \frac{1}{x-1}$, the x -axis, and the lines $x = 3$ and $x = 4$ is

(A) $\frac{5}{36}$ (B) $\ln \frac{2}{3}$ (C) $\ln \frac{4}{3}$ (D) $\ln \frac{3}{2}$ (E) $\ln 6$

_____ 7.

An equation of the line tangent to the graph of $y = \frac{2x+3}{3x-2}$ at the point $(1, 5)$ is

(A) $13x - y = 8$ (B) $13x + y = 18$ (C) $x - 13y = 64$

(D) $x + 13y = 66$ (E) $-2x + 3y = 13$

_____ 8.

If $y = \tan x - \cot x$, then $\frac{dy}{dx} =$

(A) $\sec x \csc x$ (B) $\sec x - \csc x$ (C) $\sec x + \csc x$ (D) $\sec^2 x - \csc^2 x$ (E) $\sec^2 x + \csc^2 x$

_____ 9.

If h is the function given by $h(x) = f(g(x))$, where $f(x) = 3x^2 - 1$ and $g(x) = |x|$, then $h(x) =$

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

_____ 10.

If $f(x) = (x-1)^2 \sin x$, then $f'(0) =$

- (A) -2 (B) -1 (C) 0 (D) 1 (E) 2

11. 2001—AB5

A cubic polynomial function f is defined by

$$f(x) = 4x^3 + ax^2 + bx + k$$

where a , b , and k are constants. The function f has a local minimum at $x = -1$, and the graph of f has a point of inflection at $x = -2$.

- (a) Find the values of a and b .
- (b) If $\int_0^1 f(x) dx = 32$, what is the value of k ?

12. 2001—AB6

The function f is differentiable for all real numbers. The point $\left(3, \frac{1}{4}\right)$ is on the graph of $y = f(x)$, and the slope at each point (x, y) on the graph is given by $\frac{dy}{dx} = y^2(6 - 2x)$.

- (a) Find $\frac{d^2y}{dx^2}$ and evaluate it at the point $\left(3, \frac{1}{4}\right)$.
- (b) Find $y = f(x)$ by solving the differential equation $\frac{dy}{dx} = y^2(6 - 2x)$ with the initial condition $f(3) = \frac{1}{4}$.