

Name _____
5/3/07

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Answer the following 12 multiple-choice and 1 open response problem. No work need be shown for multiple-choice problems. Clearly write the letters of your multiple-choice responses in the appropriate spaces provided on this page. Open response problems will be graded in the same manner as AP open response problems. The AP exam allows for two minutes per multiple-choice, 15 minutes per open response problem. You may want to allocate your time in the same manner.

1. _____

7. _____

2. _____

8. _____

3. _____

9. _____

4. _____

10. _____

5. _____

11. _____

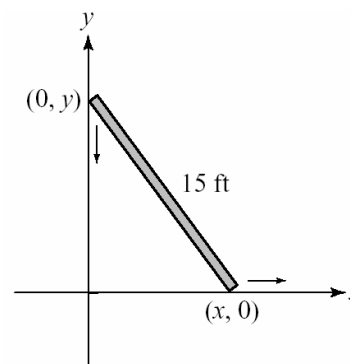
6. _____

12. _____

1. A 15-foot ladder is leaning against a building as shown so that the top of the ladder is at $(0, y)$ and the bottom is at $(x, 0)$. The ladder is falling because the ground is slippery. Assume that $\frac{dy}{dt} = -12$ feet per second at the instant when $x = 9$ feet.

Find $\frac{dx}{dt}$ at this instant.

- (A) 6 feet per second
- (B) 9 feet per second
- (C) 12 feet per second
- (D) 16 feet per second
- (E) 20 feet per second



2. Line L is tangent to the curve defined by $2xy^2 - 3y = 18$ at the point $(3, 2)$. The slope of L is:

- (A) $-\frac{8}{21}$
- (B) $-\frac{3}{32}$
- (C) $\frac{21}{10}$
- (D) $-\frac{21}{8}$
- (E) $\frac{21}{8}$

3. If $\frac{dy}{dx} = \frac{x-2}{y}$ and $y(4) = -5$, then $y(6)$ is:

- (A) $5 + \sqrt{12}$
- (B) $5 - \sqrt{12}$
- (C) $\sqrt{37}$
- (D) $-\sqrt{37}$
- (E) 1

4. The solution to which of the following differential equations could be represented by the slope field below.

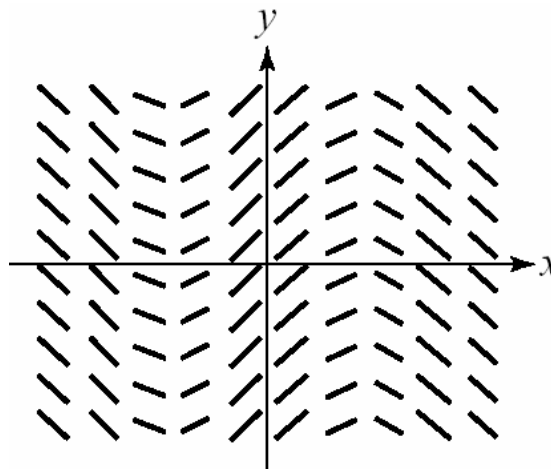
(A) $\frac{dy}{dx} = -x^3 + 4x$

(D) $\frac{dy}{dx} = -\sin x$

(B) $\frac{dy}{dx} = x^2 - 2$

(E) $\frac{dy}{dx} = \cos x$

(C) $\frac{dy}{dx} = \sin x$



5. Let $f(x) = g(h(x))$, where $h(2) = 3$, $h'(2) = 4$, $g(3) = 2$, and $g'(3) = 5$. Find $f'(2)$.

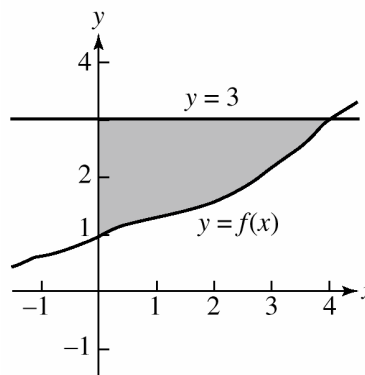
- (A) 6
- (B) 8
- (C) 15
- (D) 20
- (E) More information is needed.

6. Assume that $f(x)$ is a one-to-one function. The area of the shaded region below is equal to which of the following definite integrals?

I. $\int_0^4 (f(x) - 3) dx$

II. $\int_4^0 (f(x) - 3) dx$

III. $\int_1^3 f^{-1}(y) dy$



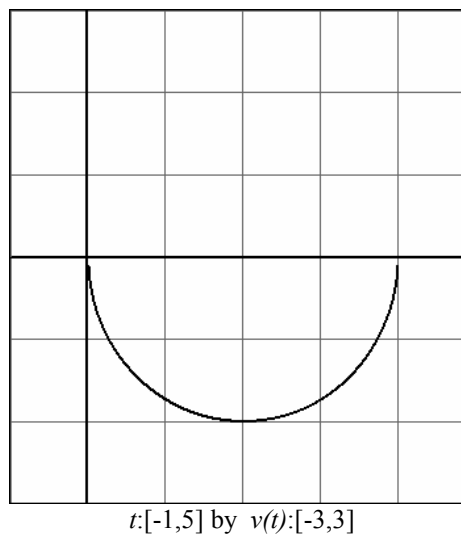
- (A) I only (B) II only (C) III only (D) I and II (E) II and III

7. Find the area of the region bounded by the x -axis and the graph of $y = (x + 1)(x - 2)^2$.

- (A) 1.25 (B) 2.75 (C) 5.25 (D) 6.25 (E) 6.75

8. The semi-circular function below represents the acceleration (in m/s^2) of an object for $0 \leq t \leq 4$. If $v(0) = 2 m/s$, evaluate $v(4)$.

- (A) 2π
 (B) $2 - 2\pi$
 (C) 4π
 (D) $2 + 4\pi$
 (E) $v(4)$ can not be determined with the available information.

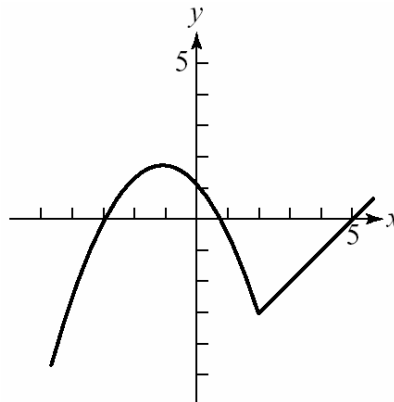


9. Find the average value of the function $y = \frac{\ln x}{x}$ on the interval $[1, a]$.

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

10. The graph of the function $y = f(x)$ is shown below. Which of the following are true for the function f ?

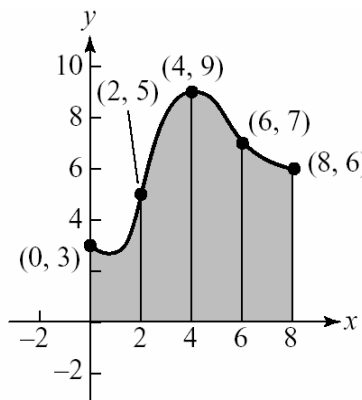
- I. $f'(2)$ is defined.
- II. $\lim_{x \rightarrow 2^+} f(x) = \lim_{x \rightarrow 2^-} f(x)$
- III. $f'(x) < 0$ for all x in the open interval $(-1, 2)$.



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

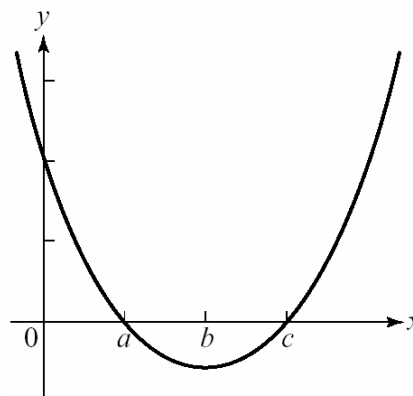
11. Use trapezoids with the indicated subintervals to estimate the area of the shaded region.

- (A) 48
- (B) 50
- (C) 51
- (D) 52
- (E) 54



12. The graph of $y = f'(x)$ is shown below. Which of the following statements about the function $f(x)$ are true?

- I. $f(x)$ is decreasing for all x between a and c .
- II. The graph of f is concave up for all x between a and c .
- III. $f(x)$ has a relative minimum at $x = a$.



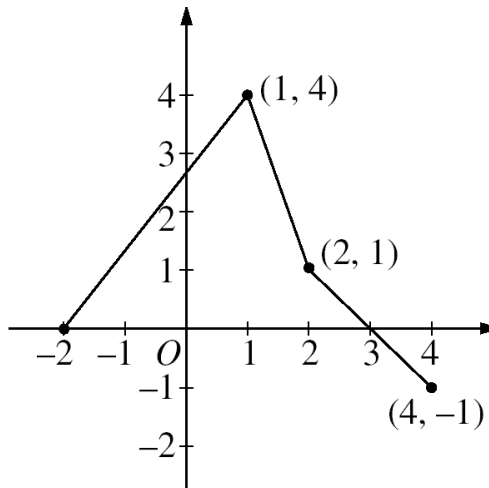
- (A) I only (B) II only (C) III only (D) I and III (E) I, II, and III

Open Response Problem

The graph of the function, f , consisting of three line segments, is given below.

Let $g(x) = \int_1^x f(t) dt$.

a. Compute $g(4)$ and $g(-2)$.



b. Find the instantaneous rate of change of g , with respect to x , at $x = 1$.

c. Find the absolute minimum value of g on the closed interval $[-2, 4]$. Justify your answer.

d. The second derivative of g is not defined at $x = 1$ and $x = 2$. Which of these values are x -coordinates of points of inflection of the graph of g ? Justify your answer.