Name_____
4/28/05

Answer each of the following 16 multiple choice problems. No work need be shown. Clearly write the letters of your responses in the appropriate spaces provided on this page.

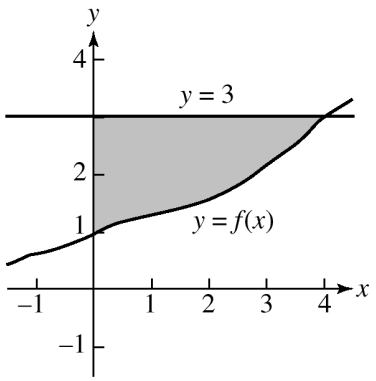
1. _____	**9.** _____
2. _____	**10.** _____
3. _____	**11.** _____
4. _____	**12.** _____
5. _____	**13.** _____
6. _____	**14.** _____
7. _____	**15.** _____
8. _____	**16.** _____

1. 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

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

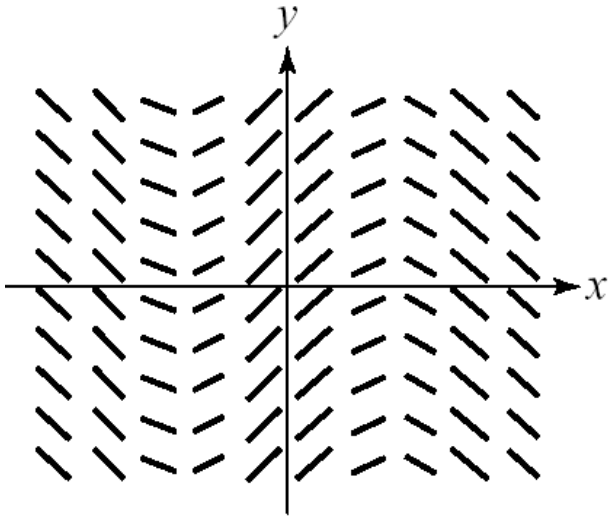
(A) $\frac{dy}{dx} = -x^3 + 4x$

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

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

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

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



3. Let $g(x) = \int_0^x (t+2)(t-3)e^{-t}dt$. For what values of x is g decreasing?

(A) $(-\infty,-1.49)$ **(B)** $(.37,\infty)$ **(C)** $(-2,3)$ **(D)** $(-\infty,-2.72)\cup(0,\infty)$ **(E)** $(3,\infty)$

4. 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

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

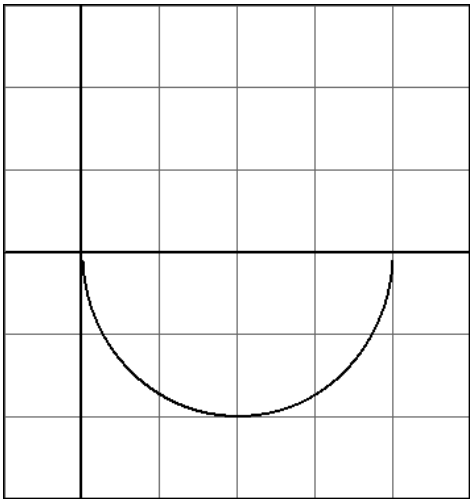
(A) 2π

(B) $2 - 2\pi$

(C) 4π

(D) $2 + 4\pi$

(E) $v(4)$ can not be determined with the available information.



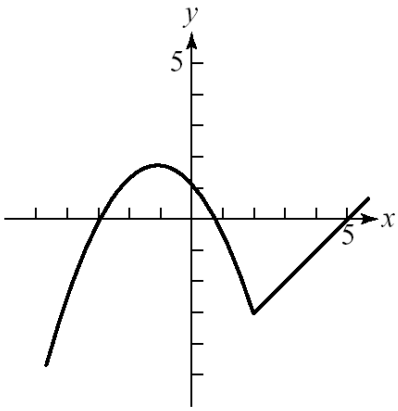
t:[-1,5] by $v(t)$:[-3,3]

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

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

7. The velocity of a particle moving along the x-axis is given by $v(t) = t\sin(t^2)$. Find the total distance traveled by the particle from $t = 0$ to $t = 3$.

(A) 1.0 **(B)** 1.5 **(C)** 2.0 **(D)** 2.5 **(E)** 3.0

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

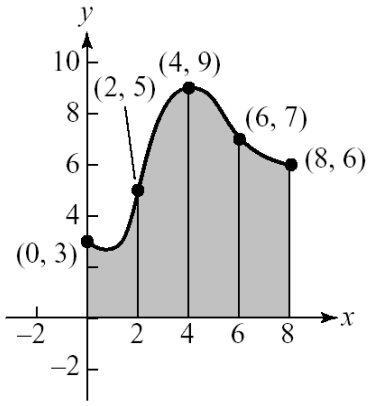
(A) 48

(B) 50

(C) 51

(D) 52

(E) 54



9. 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.

10. Let $l(x)$ be the linear approximation to the function $f(x) = e^{-x}$ at $x = 1$. Evaluate $l(.5)$.
(A) 0.607 **(B)** 0.552 **(C)** 0.368 **(D)** 0.920 **(E)** 1.104

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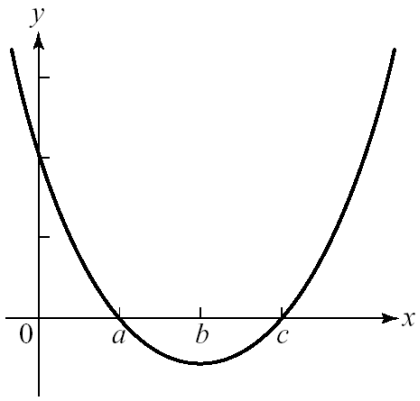
11. The graph of $y = f^{/}(x)$ is shown below. Which of the following statements about the function $f(x)$ are true?

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 $x = a$.



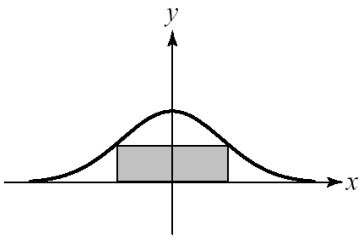
(A) I only **(B)** II only **(C)** III only **(D)** I and III **(E)** I, II, and III

12. 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)** $\frac{(\ln a)^2}{2a-2}$

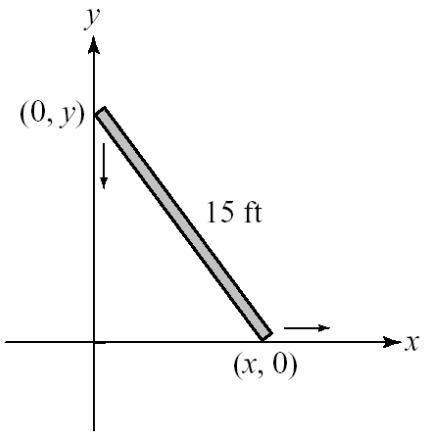
13. A rectangle is inscribed under the curve $y = e^{-x^2}$ as shown below. Find the maximum possible area of the rectangle.

(A) 0.43
(B) 0.61
(C) 0.71
(D) 0.86
(E) 1.77



14. 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



15. The base of a solid is the shape of a region between the x-axis and one arch of the curve $y = 2\sin(2x)$. Each cross section cut perpendicular to the x-axis is a semicircle whose diameter runs from the x-axis to the curve. Find the volume of the solid.

(A) 1.23 **(B)** 2.47 **(C)** 3.42 **(D)** 3.91 **(E)** 4.00

16. 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)** $\frac{21}{8}$