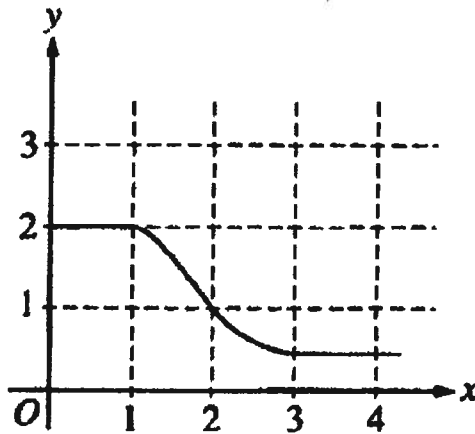


Multiple Choice

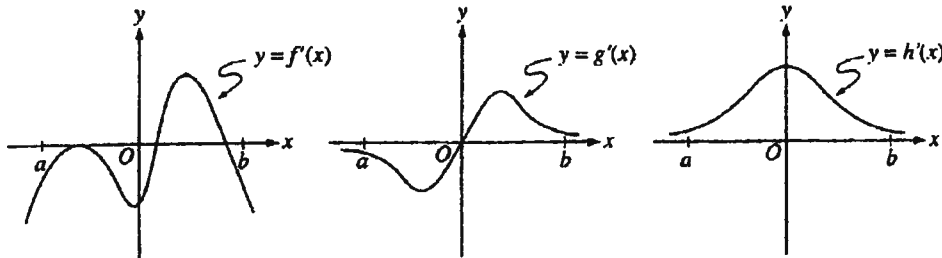
Identify the choice that best completes the statement or answers the question.

1.



The graph of f is shown in the figure above. If $\int_1^3 f(x) dx = 2.3$ and $F'(x) = f(x)$, then $F(3) - F(0) =$

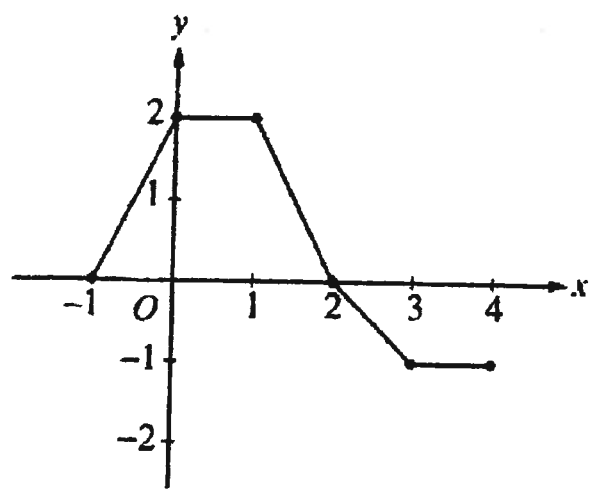
- a. 0.3
- b. 1.3
- c. 3.3
- d. 4.3
- e. 5.3



2.

The graphs of the derivatives of the functions $f, g,$ and h are shown above. Which of the functions $f, g,$ or h have a relative maximum on the open interval $a < x < b$?

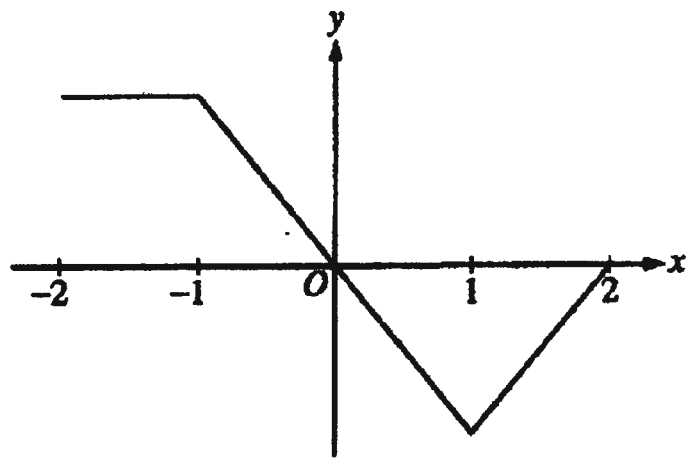
- a. f only
- b. g only
- c. h only
- d. f and g only
- e. $f, g,$ and h



3.

The graph of a piecewise-linear function f for $-1 \leq x \leq 4$, is shown above. What is the value of $\int_{-1}^4 f(x)dx$?

- a. 1
- b. 2.5
- c. 4
- d. 5.5
- e. 8



Graph of f'

4.

The graph of f' , the derivative of the function f , is shown above. Which of the following statements is true about f ?

- a. f is decreasing for $-1 \leq x \leq 1$.
- b. f is increasing for $-2 \leq x \leq 0$.
- c. f is increasing for $1 \leq x \leq 2$.
- d. f has a local minimum at $x=0$.
- e. f is not differentiable at $x = -1$ and $x=1$.

we calc.

5. The first derivative of the function f is given by $f'(x) = \frac{\cos^2 x}{x} - \frac{1}{5}$. How many critical values does f have on the open interval $(0, 10)$?

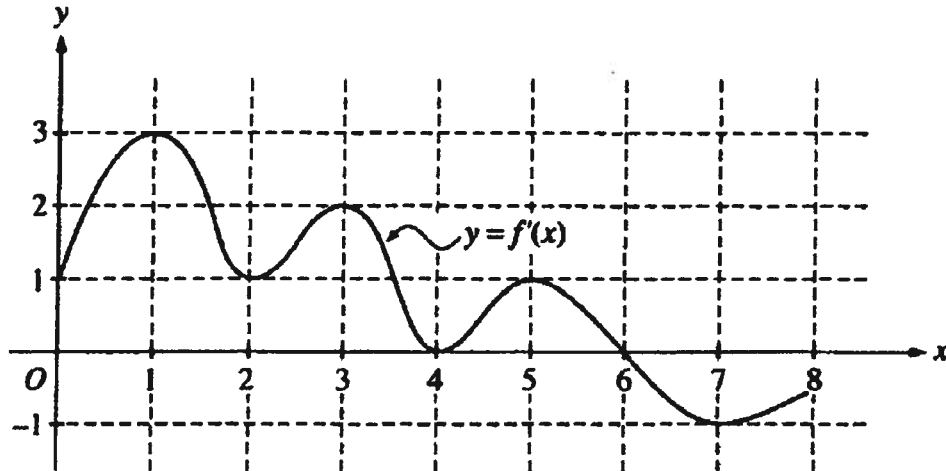
- a. One
- b. Three
- c. Four
- d. Five
- e. Seven

- use
calc
6. The function f has first derivative given by $f'(x) = \frac{\sqrt{x}}{1+x+x^3}$. What is the x-coordinate of the inflection point of the graph of f ?

3

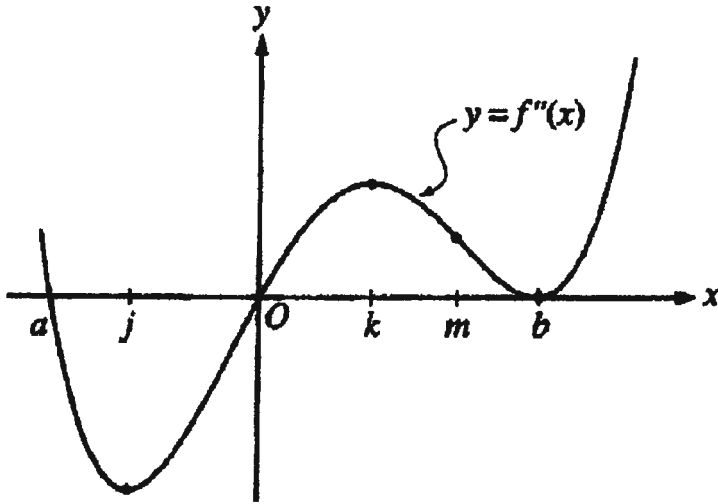
- a. 1.008
- b. 0.473
- c. 0
- d. -0.278
- e. The graph of f has no inflection point.

Questions 7-9 refer to the graph and the information given below.



The function f is defined on the closed interval $[0, 8]$. The graph of its derivative f is shown above.

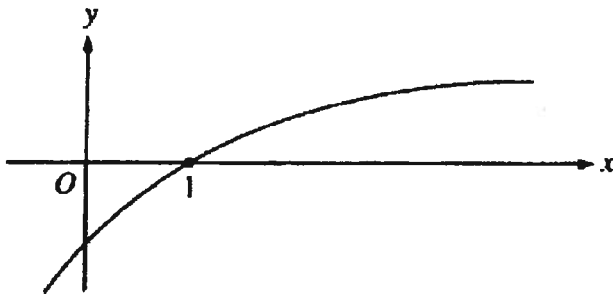
7. The point $(3, 5)$ is on the graph of $y = f(x)$. An equation of the line tangent to the graph of f at $(3, 5)$ is
- a. $y = 2$
 - b. $y = 5$
 - c. $y - 5 = 2(x - 3)$
 - d. $y + 5 = 2(x - 3)$
 - e. $y + 5 = 2(x + 3)$
8. How many points of inflection does the graph of f have?
- a. Two
 - b. Three
 - c. Four
 - d. Five
 - e. Six
9. At what value of x does the absolute minimum of f occur?
- a. 0
 - b. 2
 - c. 4
 - d. 6
 - e. 8



10.

The second derivative of the function f is given by $f''(x) = x(x-a)(x-b)^2$. The graph of f'' is shown above. For what values of x does the graph of f have a point of inflection?

- a. 0 and a only
- b. 0 and m only
- c. b and j only
- d. 0, a , and b
- e. b , j , and k



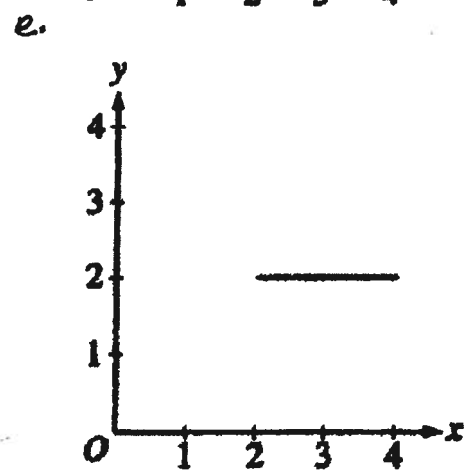
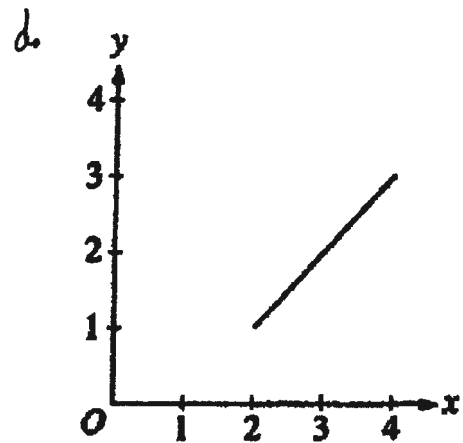
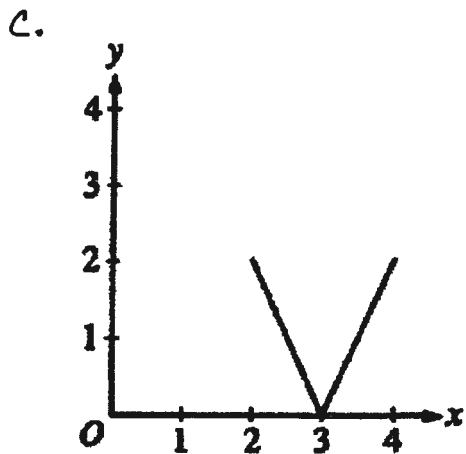
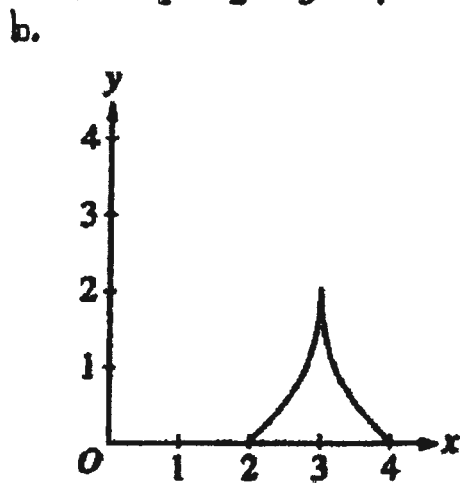
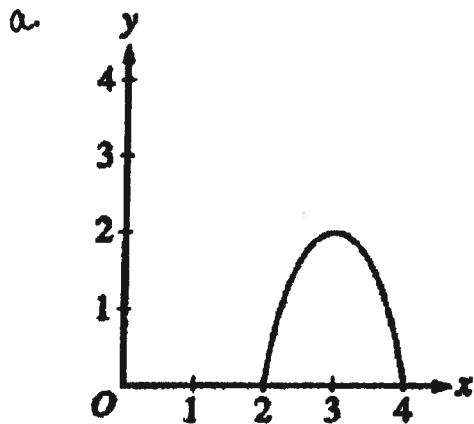
11.

The graph of a twice-differentiable function f is shown in the figure above. Which of the following is true?

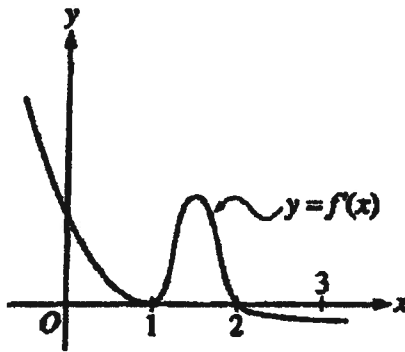
- a. $f(1) < f'(1) < f''(1)$
- b. $f(1) < f''(1) < f'(1)$
- c. $f'(1) < f(1) < f''(1)$
- d. $f''(1) < f(1) < f'(1)$
- e. $f''(1) < f'(1) < f(1)$

12. On the closed interval [2, 4], which of the following could be the graph of a function f with the property that

$$\frac{1}{4-2} \int_2^4 f(t) dt = 1?$$



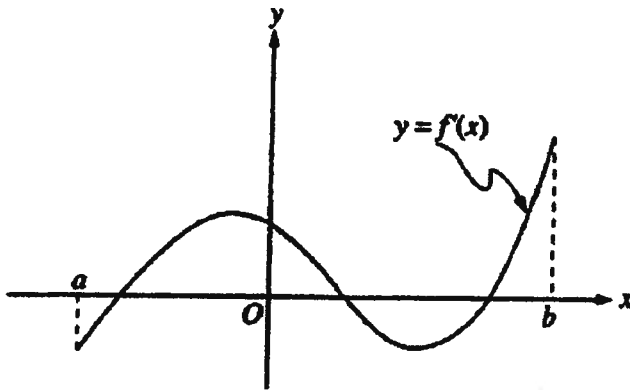
13.



The graph of f' , the derivative of the function f , is shown above. If $f(0) = 0$, which of the following must be true?

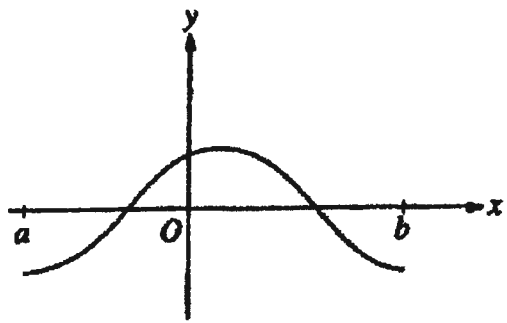
- I. $f(0) > f(1)$
 - II. $f(2) > f(1)$
 - III. $f(1) > f(3)$
- a. I only
 - b. II only
 - c. III only
 - d. I and II only
 - e. II and III only

14.



The graph of f' , the derivative of f , is shown in the figure above. Which of the following describes all relative extrema of f on the open interval (a, b) ?

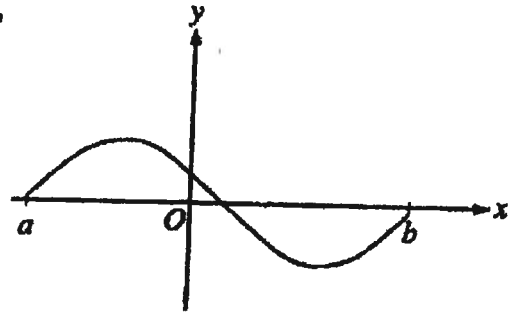
- a. One relative maximum and two relative minima
- b. Two relative maxima and one relative minimum
- c. Three relative maxima and one relative minimum
- d. One relative maximum and three relative minima
- e. Three relative maxima and two relative minima



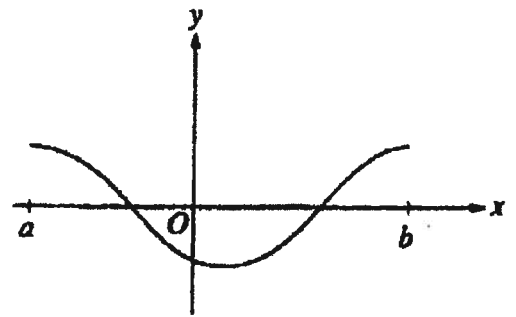
15.

The graph of f is shown in the figure above. Which of the following could be the graph of the derivative of f ?

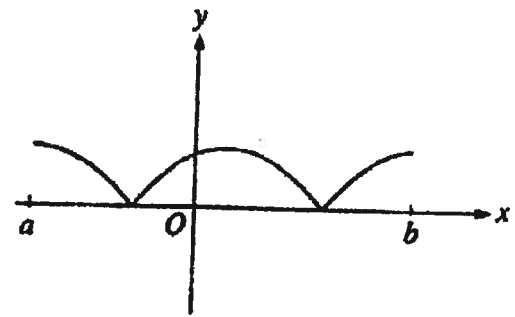
a.



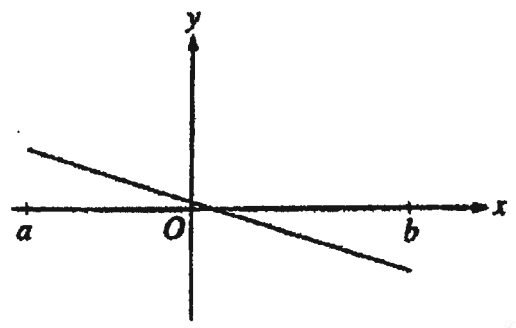
d.



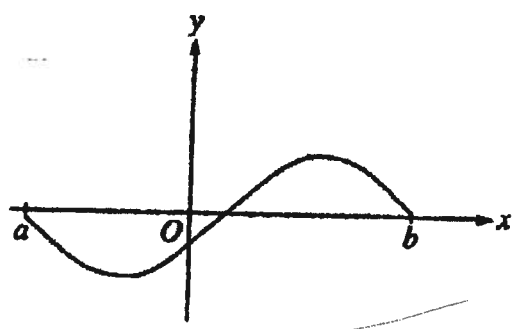
b.



e.

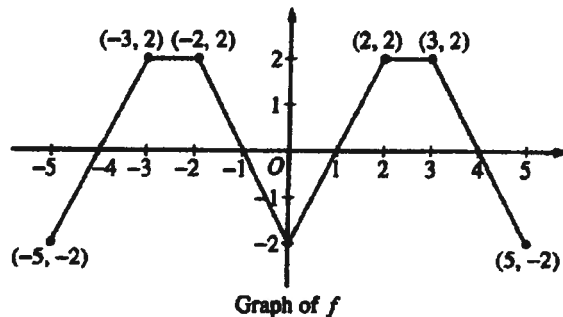


c.



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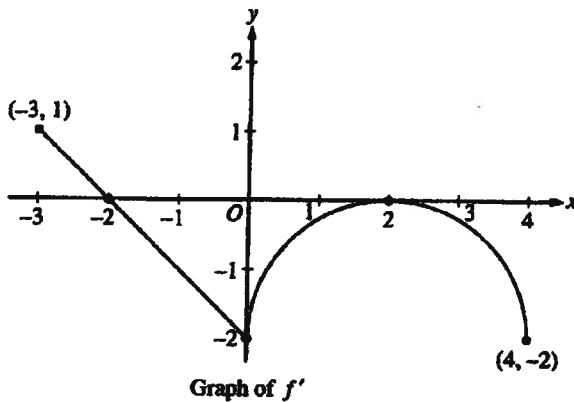
8



No Calculator

3. The graph of the function f shown above consists of six line segments. Let g be the function given by $g(x) = \int_0^x f(t) dt$.
- Find $g(4)$, $g'(4)$, and $g''(4)$.
 - Does g have a relative minimum, a relative maximum, or neither at $x = 1$? Justify your answer.
 - Suppose that f is defined for all real numbers x and is periodic with a period of length 5. The graph above shows two periods of f . Given that $g(5) = 2$, find $g(10)$ and write an equation for the line tangent to the graph of g at $x = 108$.

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No Calculator

4. Let f be a function defined on the closed interval $-3 \leq x \leq 4$ with $f(0) = 3$. The graph of f' , the derivative of f , consists of one line segment and a semicircle, as shown above.
- On what intervals, if any, is f increasing? Justify your answer.
 - Find the x -coordinate of each point of inflection of the graph of f on the open interval $-3 < x < 4$. Justify your answer.
 - Find an equation for the line tangent to the graph of f at the point $(0, 3)$.
 - Find $f(-3)$ and $f(4)$. Show the work that leads to your answers.

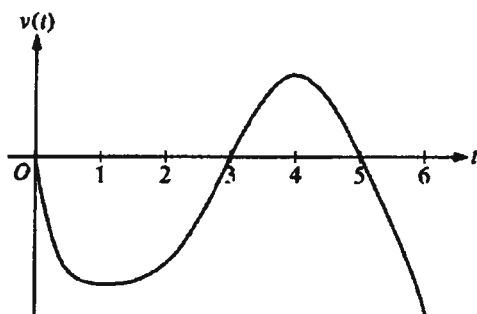
2008 AP[®] CALCULUS AB FREE-RESPONSE QUESTIONS

CALCULUS AB
SECTION II, Part B

Time—45 minutes

Number of problems—3

No calculator is allowed for these problems.



Graph of v

4. A particle moves along the x -axis so that its velocity at time t , for $0 \leq t \leq 6$, is given by a differentiable function v whose graph is shown above. The velocity is 0 at $t = 0$, $t = 3$, and $t = 5$, and the graph has horizontal tangents at $t = 1$ and $t = 4$. The areas of the regions bounded by the t -axis and the graph of v on the intervals $[0, 3]$, $[3, 5]$, and $[5, 6]$ are 8, 3, and 2, respectively. At time $t = 0$, the particle is at $x = -2$.
- For $0 \leq t \leq 6$, find both the time and the position of the particle when the particle is farthest to the left. Justify your answer.
 - For how many values of t , where $0 \leq t \leq 6$, is the particle at $x = -8$? Explain your reasoning.
 - On the interval $2 < t < 3$, is the speed of the particle increasing or decreasing? Give a reason for your answer.
 - During what time intervals, if any, is the acceleration of the particle negative? Justify your answer.

WRITE ALL WORK IN THE PINK EXAM BOOKLET.