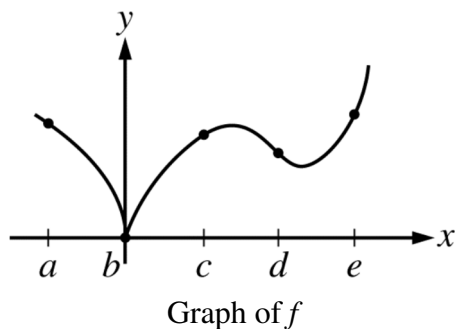


Exercises #1-17 are from Section I, Part B of the AP Calculus AB 2012 Practice Test.
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**A GRAPHING CALCULATOR IS REQUIRED FOR SOME QUESTIONS
ON THIS PART OF THE EXAMINATION.**



1. The graph of the function f is shown in the figure above. For which of the following values of x is $f'(x)$

(A) a (B) b (C) c (D) d (E) e

2. Let f be a function that is continuous on the closed interval $[2, 4]$ with $f(2) = 10$ and $f(4) = 20$. Which of the following is guaranteed by the Intermediate Value Theorem?

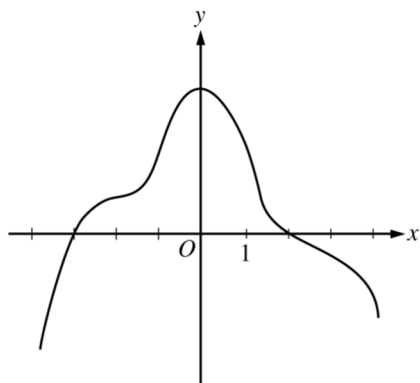
(A) $f(x) = 13$ has at least one solution in the open interval $(2, 4)$.
 (B) $f(3) = 15$
 (C) f attains a maximum on the open interval $(2, 4)$.
 (D) $f'(x) = 5$ has at least one solution in the open interval $(2, 4)$.
 (E) $f'(x) > 0$ for all x in the open interval $(2, 4)$.

3. The graph of $y = e^{\tan x} - 2$ crosses the x -axis at one point in the interval $[0, 1]$. What is the slope of the graph at this point?

(A) 0.606 (B) 2 (C) 2.242 (D) 2.961 (E) 3.747

4. A particle moves along the x -axis. The velocity of the particle at time t is given by $v(t)$, and the acceleration of the particle at time t is given by $a(t)$. Which of the following gives the average velocity of the particle from time $t = 0$ to time $t = 8$?

(A) $\frac{a(8) - a(0)}{8}$ (B) $\frac{1}{8} \int_0^8 v(t) dt$ (C) $\frac{1}{8} \int_0^8 |v(t)| dt$
 (D) $\frac{1}{2} \int_0^8 v(t) dt$ (E) $\frac{v(0) + v(8)}{2}$



Graph of f'

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

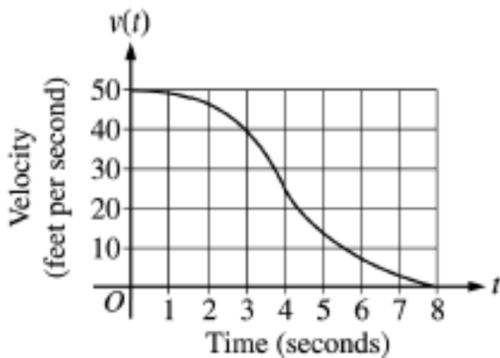
- I. f has a relative minimum at $x = -3$.
 - II. The graph of f has a point of inflection at $x = -2$.
 - III. The graph of f is concave down for $0 < x < 4$.
- (A) I only (B) II only (C) III only
 (D) I and II only (E) I and III only

6. Water is pumped into a tank at a rate of $r(t) = 3 - (1 - e^{-0.16t})$ gallons per minute, where t is the number of minutes since the pump was turned on. If the tank contained 800 gallons of water when the pump was turned on, how much water, to the nearest gallon, is in the tank after 20 minutes?

- (A) 380 gallons (B) 420 gallons (C) 829 gallons
 (D) 1220 gallons (E) 1376 gallons

7. If $f'(x) = \sqrt{x^4 + 1} + x^3 - 3x$, then f has a local maximum at $x =$

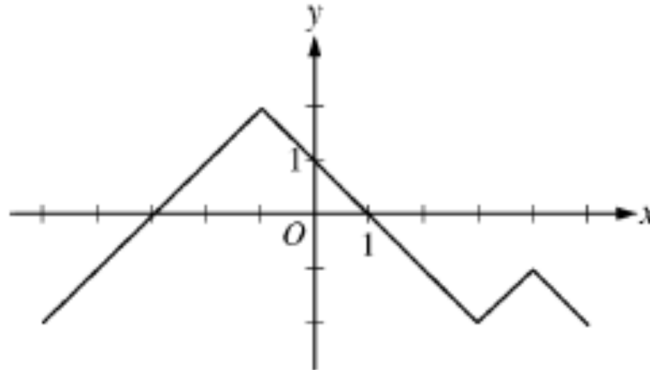
- (A) -2.314 (B) -1.332 (C) 0.350 (D) 0.829 (E) 1.234



8. The graph above gives the velocity, v , in ft/sec, of a car for $0 \leq t \leq 8$, where t is the time in seconds. Of the following, which is the best estimate of the distance traveled by the car from $t = 0$ until the car comes to a complete stop?

- (A) 21 ft (B) 26 ft (C) 180 ft (D) 210 ft (E) 260 ft

9. For $-1.5 < x < 1.5$, let f be a function with first derivative given by $f'(x) = e^{(x^4 - 2x^2 + 1)} - 2$. Which of the following are all intervals on which the graph of f is concave down?
- (A) $(-0.418, 0.418)$ only
 (B) $(-1, 1)$
 (C) $(-1.354, -0.409)$ and $(0.409, 1.354)$
 (D) $(-1.5, -1)$ and $(0, 1)$
 (E) $(-1.5, -1.354)$, $(-0.409, 0)$, and $(1.354, 1.5)$



Graph of f'

10. The graph of f' , the derivative of f , is shown in the figure above. The function f has a local maximum at $x =$
- (A) -3 (B) -1 (C) 1 (D) 3 (E) 4
11. If $f'(x) > 0$ for all real numbers x and $\int_4^7 f(t) dt = 0$, which of the following could be a table of values for the function f ?

(A)

x	$f(x)$
4	-4
5	-3
7	0

(B)

x	$f(x)$
4	-4
5	-2
7	5

(C)

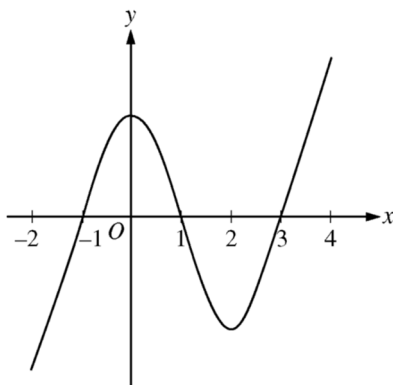
x	$f(x)$
4	-4
5	6
7	3

(D)

x	$f(x)$
4	0
5	0
7	0

(E)

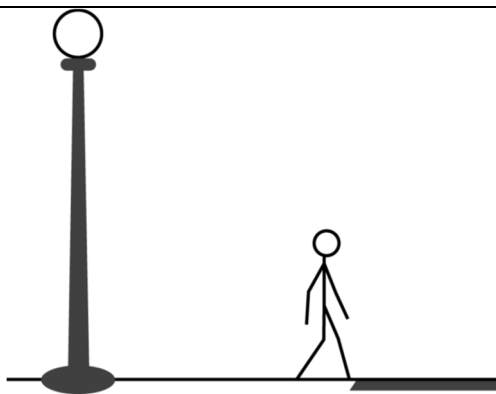
x	$f(x)$
4	0
5	3
7	4



Graph of f''

12. The graph of f'' , the second derivative of f , is shown above for $-2 \leq x \leq 4$. What are all the intervals on which the graph of the function f is concave down?

- (A) $-1 < x < 1$ (B) $0 < x < 2$ (C) $1 < x < 3$ only
 (D) $-2 < x < -1$ only (E) $-2 < x < -1$ and $1 < x < 3$



13. A person whose height is 6 feet is walking away from the base of a streetlight along a straight path at a rate of 4 feet per second. If the height of the streetlight is 15 feet, what is the rate at which the person's shadow is lengthening?

- (A) 1.5 ft/sec (B) 2.667 ft/sec (C) 3.75 ft/sec (D) 6 ft/sec (E) 10 ft/sec

14. A particle moves along a line so that its acceleration for $t \geq 0$ is given by $a(t) = \frac{t+3}{\sqrt{t^3+1}}$. If the particle's velocity at $t = 0$ is 5, what is the velocity of the particle at $t = 3$?

- (A) 0.713 (B) 1.134 (C) 6.134 (D) 6.710 (E) 11.710

15. Let f be a function such that $\int_6^{12} f(2x) dx = 10$. Which of the following must be true?

- (A) $\int_{12}^{24} f(t) dt = 5$ (B) $\int_{12}^{24} f(t) dt = 20$ (C) $\int_6^{12} f(t) dt = 5$
 (D) $\int_6^{12} f(t) dt = 20$ (E) $\int_3^6 f(t) dt = 5$

x	-2	0	3	5	6
$f'(x)$	3	1	4	7	5

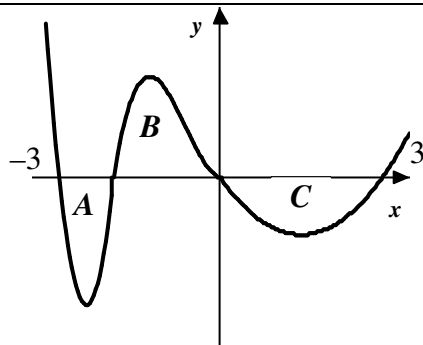
16. Let f be a polynomial function with values of $f'(x)$ at selected values of x given in the table above. Which of the following must be true for $-2 < x < 6$?
- (A) The graph of f is concave up.
 (B) The graph of f has at least two points of inflection.
 (C) f is increasing
 (D) f has no critical points
 (E) f has at least two relative extrema.

17. Let R be the region in the first quadrant bounded below by the graph $y = x^2$ and above the graph of $y = \sqrt{x}$. R is the base of a solid whose cross sections perpendicular to the x -axis are squares. What is the volume of the solid?
- (A) 0.129 (B) 0.300 (C) 0.333 (D) 0.700 (E) 1.271

Exercises #18-34 are from Section I, Part B of the AP Calculus AB 2003 Practice Test.
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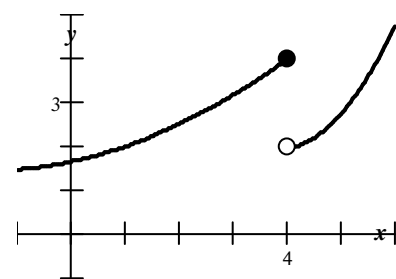
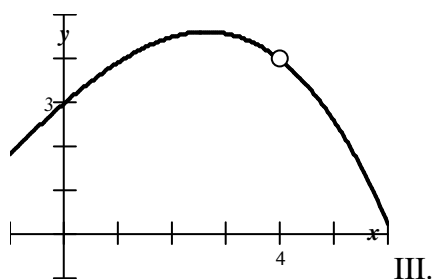
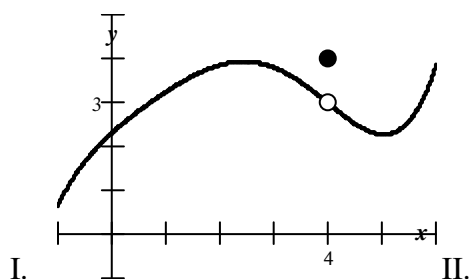
A GRAPHING CALCULATOR IS REQUIRED FOR SOME QUESTIONS
 ON THIS PART OF THE EXAMINATION.

18. A particle moves along the x -axis so that at any time $t \geq 0$, its velocity is given by $v(t) = 3 + 4.1 \cos(0.9t)$. What is the acceleration of the particle at time $t = 4$?
- (A) -2.016 (B) -0.677 (C) 1.633 (D) 1.814 (E) 2.978



19. The regions A , B , and C in the figure above are bounded by the graph of the function f and the x -axis. If the area of each region is 2, what is the value of $\int_{-3}^3 (f(x) + 1) dx$?
- (A) -2 (B) -1 (C) 4 (D) 7 (E) 12
20. The radius of a circle is increasing at a constant rate of 0.2 meters per second. What is the rate of increase in the area of the circle at the instant when the circumference of the circle is 20π meters?
- (A) $0.04\pi \text{ m}^2/\text{sec}$ (B) $0.4\pi \text{ m}^2/\text{sec}$ (C) $4\pi \text{ m}^2/\text{sec}$
 (D) $20\pi \text{ m}^2/\text{sec}$ (E) $100\pi \text{ m}^2/\text{sec}$

21. For which of the following does $\lim_{x \rightarrow 4} f(x)$ exist?



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

22. The function f is continuous for $-2 \leq x \leq 1$ and differentiable for $-2 < x < 1$. If $f(-2) = -5$ and $f(1) = 4$, which of the following statements could be false?

- (A) There exists c , where $-2 < c < 1$, such that $f(c) = 0$.
 (B) There exists c , where $-2 < c < 1$, such that $f'(c) = 0$.
 (C) There exists c , where $-2 < c < 1$, such that $f(c) = 3$.
 (D) There exists c , where $-2 < c < 1$, such that $f'(c) = 3$.
 (E) There exists c , where $-2 < c < 1$, such that $f(c) \geq f(x)$ for all x on the closed interval $-2 \leq x \leq 1$.

23. Let f be the function with derivative given by $f'(x) = \sin(x^2 + 1)$. How many relative extrema does f have on the interval $2 < x < 4$?

- (A) One (B) Two (C) Three (D) Four (E) Five

24. The rate of change of the altitude of a hot-air balloon is given by $r(t) = t^3 - 4t^2 + 6$ for $0 \leq t \leq 8$. Which of the following expressions gives the change in altitude of the balloon during the time the altitude is decreasing?

- (A) $\int_{1.572}^{3.514} r(t) dt$ (B) $\int_0^8 r(t) dt$ (C) $\int_0^{2.667} r(t) dt$
 (D) $\int_{1.572}^{3.514} r'(t) dt$ (E) $\int_0^{2.667} r'(t) dt$

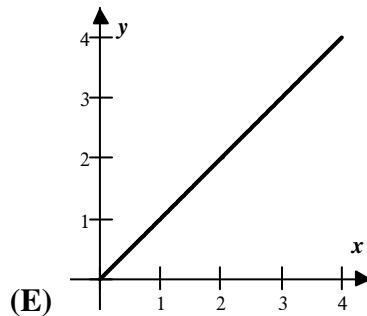
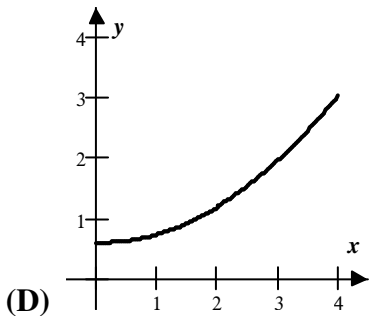
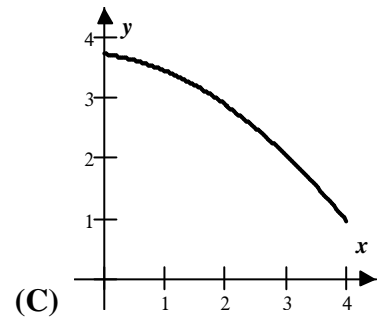
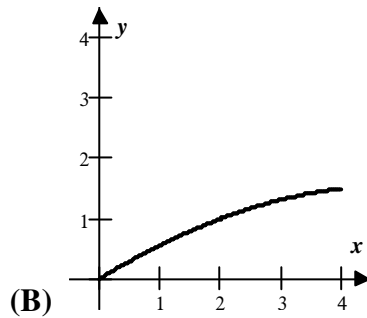
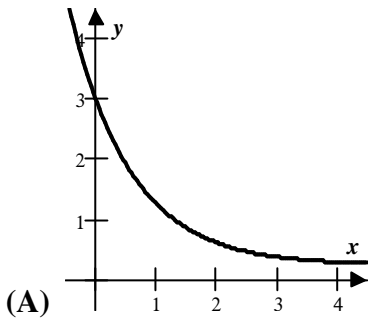
25. The velocity, in ft/sec, of a particle moving along the x -axis is given by the function $v(t) = e^t + te^t$. What is the average velocity of the particle from time $t = 0$ to time $t = 3$?

- (A) 20.086 ft/sec (B) 26.447 ft/sec (C) 32.809 ft/sec
 (D) 40.671 ft/sec (E) 79.342 ft/sec

26. A pizza, heated to a temperature of 350 degrees Fahrenheit ($^{\circ}\text{F}$), is taken out of an oven and placed in a 75°F room at time $t = 0$ minutes. The temperature of the pizza is changing at a rate of $-110e^{-0.4t}$ degrees Fahrenheit per minute. To the nearest degree, what is the temperature of the pizza at time $t = 5$ minutes?

- (A) 112°F (B) 119°F (C) 147°F (D) 238°F (E) 335°F

27. If a trapezoidal sum overapproximates $\int_0^4 f(x) dx$, and a right Riemann sum underapproximates $\int_0^4 f(x) dx$, which of the following could be the graph of $y = f(x)$?



28. The base of a solid is the region in the first quadrant bounded by the y -axis, the graph of $y = \tan^{-1} x$, the horizontal line $y = 3$, and the vertical line $x = 1$. For this solid, each cross section perpendicular to the x -axis is a square. What is the volume of the solid?

(A) 2.561 (B) 6.612 (C) 8.046 (D) 8.755 (E) 20.773

29. 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 ?

(A) 1.008 (B) 0.473 (C) 0
 (D) -0.278 (E) The graph of f has no inflection point.

