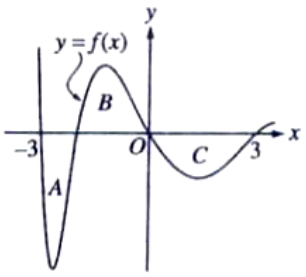
2003 AP Calculus Practice Exam–Calculator Section

1. A particle moves along the x-axis so that at any time $t \geq 0$,its velocity is given by

   $v(t) = -1 + 2.1\cos(0.7t)$. What is the acceleration of the particle at time $= 3$?

   A) -1.290
   B) -1.269
   C) -1.436
   D) 1.488
   E) 1.731

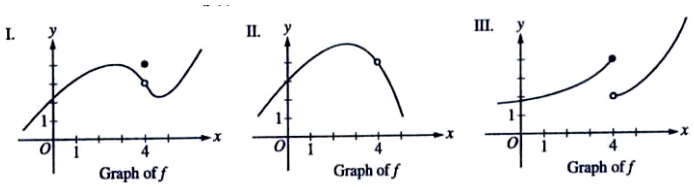


2. The regions A, B, and C in the figure above are bounded by the graph of the function *f* and the x-axis. If the area of each region is 3, what is the value of $\int_{-3}^{3}(f(x) + cosx)dx$?

   A) -5.718
   B) -2.718
   C) .282
   D) 3.282
   E) 6.282

3. The radius of a circle is increasing at a constant rate of .3 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 30π meters?

   A) $0.03\pi\ m^2/sec$
   B) $0.9\pi\ m^2/sec$
   C) $9\pi\ m^2/sec$
   D) $30\pi\ m^2/sec$
   E) $90\pi\ m^2/sec$



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

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

5. The function *f* is continuous for $-2 \le x \le 3$ and differentiable for $-2 < x < 3$. If $f(-2) = -3$ and $f(3) = 5$. Which of the following statements must be true?

   A) There exists c, where $-2 < c < 3$, such that $f'(c) = 0$.
   B) There exists c, where $-2 < c < 3$, such that $f"(c) > 0$.
   C) There exists c, where $-2 < c < 3$, such that $f"(c) < 0$.
   D) There exists c, where $-2 < c < 3$, such that $f"(c) = 0$.
   E) There exists c, where $-2 < c < 3$, $\lim_{x\to c} f(x)$ exists.

6. Let *f* be the function with derivative given by $f'(x) = cos(x^2 - 1)$. How many points of inflection does *f* have on the interval $0 < x < 4$?

   A) 1
   B) 2
   C) 3
   D) 4
   E) 5

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

   A) $\int_{-2}^{2} r(t)dt$
   B) $\int_{-2}^{2} r'(t)dt$
   C) $\int_{-.732}^{1} r(t)dt$
   D) $\int_{-.732}^{1} r'(t)dt$
   E) $\int_{-2}^{0} r(t)dt$

8. The velocity, in ft/sec, of a particle moving along the x-axis is given by the function $v(t) = e^t - te^t + 3e$. What is the average velocity of the particle from time $t = -3$ to time $t = 2$.

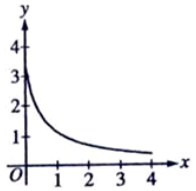
   A) 8.105
   B) 37.525
   C) 40.525
   D) 42.525
   E) 202.626

9. A pizza, heated to a temperature of 375 degrees Fahrenheit (°F), is taken out of an oven and placed in a 78°F room at time $t = 0$ minutes. The temperature of the pizza is changing at a rate of $-102e^{-.4t}$ degrees Fahrenheit per minute. To the nearest degree, what is the temperature of the pizza at time $t = 4$ minutes?

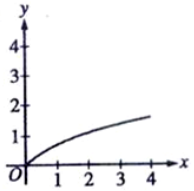
   A) 47°F
   B) 93°F
   C) 171°F
   D) 249°F
   E) 327°F

10. If a trapezoidal sum under-approximates $\int_0^4 f(x)dx$, and a left Riemann sum over approximates $\int_0^4 f(x)dx$, which of the following could be the graph of $y = f(x)$?

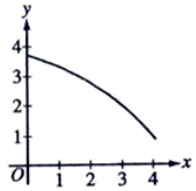
(A)



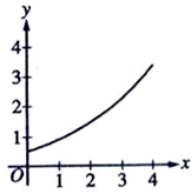
(B)



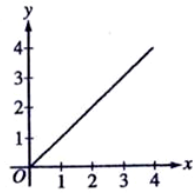
(C)



(D)



(E)



11. 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 $y = 4$, and the line $x = 1$. For this solid, each cross section perpendicular to the x-axis is a square. What is the volume of the solid?

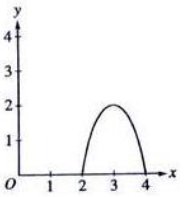
A) 3.561
B) 3.755
C) 7.316
D) 12.735
E) 24.444

12. 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*?

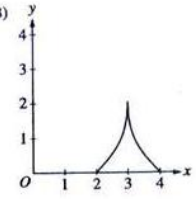
A) .698
B) .706
C) 1.118
D) 1.236
E) 1.177

13. On the closed interval $[2,4]$, which of the following could be the graph of a function f with the property that $\frac{1}{4-2}\int_2^4 f(t)dt < 1$?

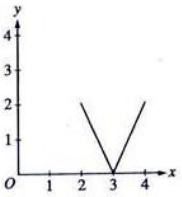
(A)



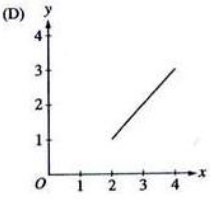
(B)



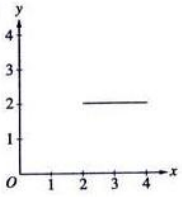
(C)



(D)



(E)



14. Let f be a differentiable function with $f(3) = 4\ and\ f'(3) = -3$, and let g be the function defined by $g(x) = x^2 f(x)$. Which of the following is an equation of the line tangent to the graph of g at the point where $x = 3$?

A) $y - 36 = -3(x - 3)$
B) $y - 4 = -3(x - 3)$
C) $y - 36 = 24(x - 3)$
D) $y - 4 = -24(x - 3)$
E) $y - 36 = -12(x - 3)$

15. For all x in the closed interval $[2,5]$, the function *f* has a negative first derivative and a positive second derivative. Which of the following could be a table of values for *f* ?

(A)

x	$f(x)$
2	7
3	9
4	12
5	16

(B)

x	$f(x)$
2	7
3	11
4	14
5	16

(C)

x	$f(x)$
2	16
3	12
4	9
5	7

(D)

x	$f(x)$
2	16
3	14
4	11
5	7

(E)

x	$f(x)$
2	16
3	13
4	10
5	7

16. A particle moves along the x-axis so that at any time $t > 0$, its acceleration is given by $a(t) = \ln(2 + 3^t)$. If the velocity of the particle is 3 at time $t = 1$, then the velocity of the particle at time $t = 4$?

A) 5.745
B) 6.633
C) 8.745
D) 9.633
E) 11.745

17. Let g be the function given by $g(x) = \int_0^x \cos(et^2 - \pi)\, dt$ for $-1 \leq x \leq 1$. On which of the following intervals is g decreasing?

A) $-1 \leq x \leq -.760$
B) $-.760 \leq x \leq .760$
C) $.760 \leq x \leq 1$
D) $-1 \leq x \leq 0$
E) $0 \leq x \leq 1$

Solutions

1. B
2. B
3. C
4. C
5. E
6. E
7. C
8. A
9. C
10. C
11. D
12. A
13. B
14. A
15. C
16. E
17. B