

**Review for Quiz on FTC, Rate problems, and Average Value**  
*AP Calculus*

**Name:**

Questions from 2003 and 2008 AP exams

7. A particle moves along the  $x$ -axis with velocity given by  $v(t) = 3t^2 + 6t$  for time  $t \geq 0$ . If the particle is at position  $x = 2$  at time  $t = 0$ , what is the position of the particle at  $t = 1$ ?

- (A) 4      (B) 6      (C) 9      (D) 11      (E) 12

23.  $\frac{d}{dx} \left( \int_0^{x^2} \sin(t^3) dt \right) =$

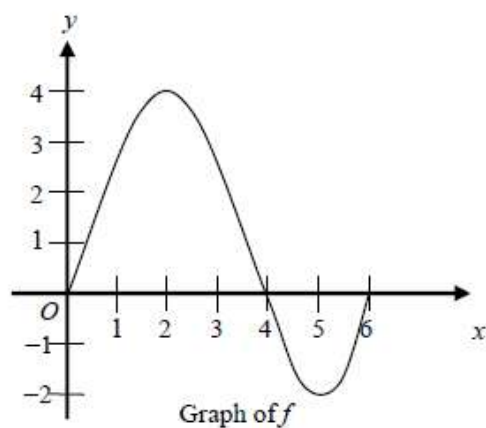
- (A)  $-\cos(x^6)$       (B)  $\sin(x^3)$       (C)  $\sin(x^6)$       (D)  $2x \sin(x^3)$       (E)  $2x \sin(x^6)$

81. If  $G(x)$  is an antiderivative for  $f(x)$  and  $G(2) = -7$ , then  $G(4) =$

- (A)  $f'(4)$   
(B)  $-7 + f'(4)$   
(C)  $\int_2^4 f(t) dt$   
(D)  $\int_2^4 (-7 + f(t)) dt$   
(E)  $-7 + \int_2^4 f(t) dt$

79. If  $\int_{-5}^2 f(x) dx = -17$  and  $\int_5^2 f(x) dx = -4$ , what is the value of  $\int_{-5}^5 f(x) dx$ ?

- (A) -21      (B) -13      (C) 0      (D) 13      (E) 21

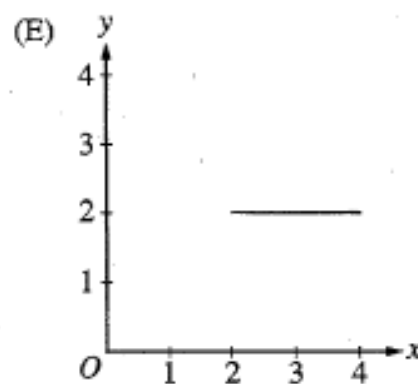
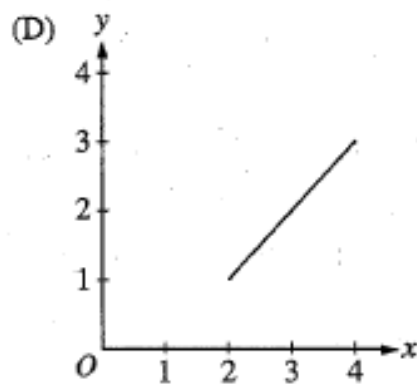
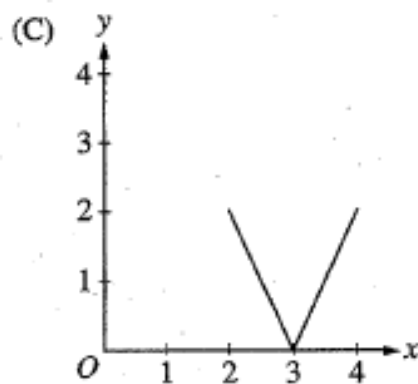
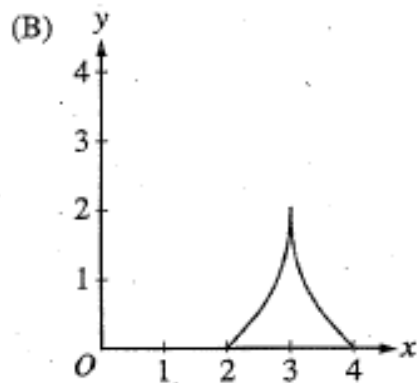
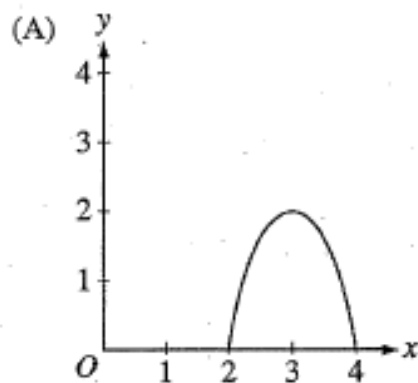


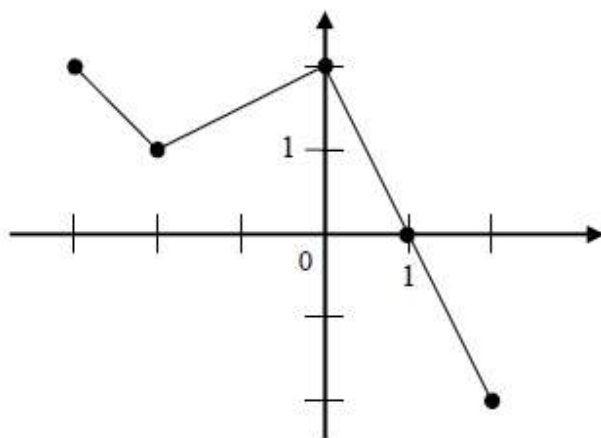
17. The graph of the function  $f$  shown above has horizontal tangents at  $x = 2$  and  $x = 5$ . Let  $g$  be the function defined by  $g(x) = \int_0^x f(t) dt$ . For what values of  $x$  does the graph of  $g$  have a point of inflection?

- (A) 2 only      (B) 4 only      (C) 2 and 5 only      (D) 2, 4, and 5      (E) 0, 4, and 6

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

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





Graph of  $f$

9. The graph of the piecewise linear function  $f$  is shown in the figure above. If  $g(x) = \int_{-2}^x f(t) dt$ , which of the following values is greatest?

- (A)  $g(-3)$     (B)  $g(-2)$     (C)  $g(0)$     (D)  $g(1)$     (E)  $g(2)$

87. An object traveling in a straight line has position  $x(t)$  at time  $t$ . If the initial position is  $x(0) = 2$  and the velocity of the object is  $v(t) = \sqrt[3]{1+t^2}$ , what is the position of the object at time  $t = 3$ ?

- (A) 0.431    (B) 2.154    (C) 4.512    (D) 6.512    (E) 17.408

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

- (A) 0.462      (B) 1.609      (C) 2.555      (D) 2.886      (E) 3.346

84. A pizza, heated to a temperature of 350 degrees Fahrenheit ( $^{\circ}\text{F}$ ), is taken out of an oven and placed in a  $75^{\circ}\text{F}$  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)  $112^{\circ}\text{F}$       (B)  $119^{\circ}\text{F}$       (C)  $147^{\circ}\text{F}$       (D)  $238^{\circ}\text{F}$       (E)  $335^{\circ}\text{F}$

82. 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)  $\int_0^8 r(t) dt$

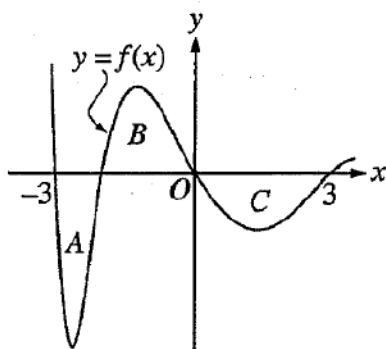
(C)  $\int_0^{2.667} r(t) dt$

(D)  $\int_{1.572}^{3.514} r'(t) dt$

(E)  $\int_0^{2.667} r'(t) dt$

91. What is the average value of  $y = \frac{\cos x}{x^2 + x + 2}$  on the closed interval  $[-1, 3]$ ?

- (A)  $-0.085$     (B)  $0.090$     (C)  $0.183$     (D)  $0.244$     (E)  $0.732$



77. 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)  $12$

