AP Calculus 2007 Released Multiple-Choice CALCULATOR REQUIRED: (76 - 92) Time = 50 minutes.

76. A particle moves along the x-axis so that at any time $t \geq 0$ its velocity is given by $v(t) = t^2 \ln(t+2)$. What is the acceleration of the particle at time t = 6?

a) 1.500 b) 20.453 c) 29.453 d) 74.860 e) 133.417

77. If $\int_0^3 f(x)\,dx = 6$ and $\int_3^5 f(x)\,dx = 4$, then $\int_0^5 \left(3 + 2f(x)\right) dx =$

a) 10 b) 20 c) 23 d) 35 e) 50

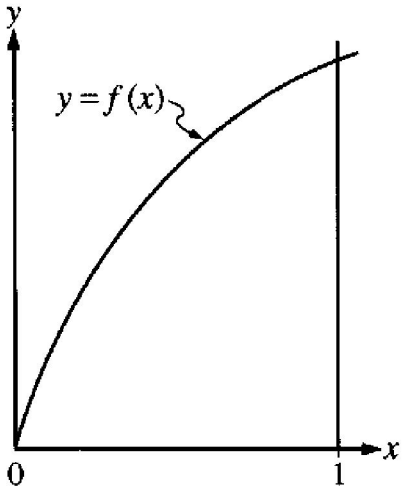
78. For $t \geq 0$ hours, H is a differentiable function of f that gives the temperature, in degrees Celsius, at an Arctic weather station. Which of the following is the best interpretation of $H'(24)$?

a) The change in temperature during the first day.
b) The change in temperature during the 24^{th} hour.
c) The average rate at which the temperature changed during the 24^{th} hour.
d) The rate at which the temperature is changing during the first day.
e) The rate at which the temperature is changing at the end of the 24^{th} hour.

79. A spherical tank contains 81.637 gallons of water at time t = 0 minutes. For the next 6 minutes, water flows out of the tank at a rate of $9\sin\left(\sqrt{t+1}\right)$ gallons per minute. How many gallons of water are in the tank at the end of the 6 minutes?

a) 36.606 b) 45.031 c) 68.858 d) 77.355 e) 126.668

80. A left Riemann sum, a right Riemann sum, and a trapezoidal sum are used to approximate the value of $\int_0^1 f(x)\,dx$, each using the same number of subintervals. The graph of the function f is shown in the figure at the right. Which of the sums give an underestimate of the value of $\int_0^1 f(x)\,dx$?



I. Left sum
II. Right sum
III. Trapezoidal sum

a) I only b) II only c) III only d) I and III only e) II and III only

81. The first derivative of the function f is given by $f'(x) = x - 4e^{-\sin(2x)}$. How many points of inflection does the graph of f have on the interval $0 < x < 2\pi$?

a) Three b) Four c) Five d) Six e) Seven

82. If f is a continuous function on the closed interval [a, b], which of the following must be true?

a) There is a number c in the open interval (a, b) such that f(c) = 0.
b) There is a number c in the open interval (a, b) such that f(a) < f(c) < f(b).
c) There is a number c in the closed interval [a, b] such that $f(c) \geq f(x)$ for all x in [a, b].
d) There is a number c in the open interval (a, b) such that $f'(c) = 0$.
e) There is a number c in the open interval (a, b) such that $f'(c) = \dfrac{f(b) - f(a)}{b - a}$.

83.

x	2.5	2.8	3.0	3.1
$f(x)$	31.25	39.20	45	48.05

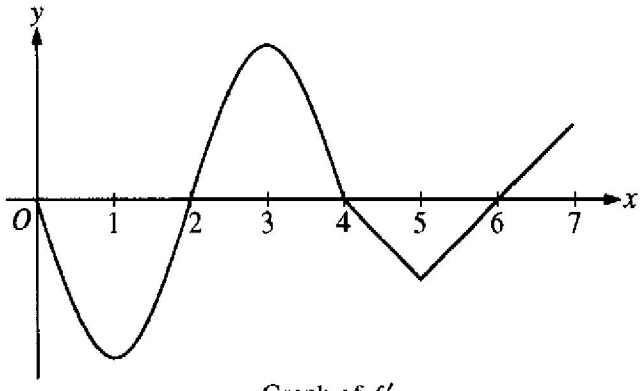
The function f is differentiable and has values as shown in the table above. Both f' and f'' are strictly increasing on the interval $0 \leq x \leq 5$. Which of the following could be the value of $f'(3)$?

a) 20 b) 27.5 c) 29 d) 30 e) 30.5

84. The graph of f', the derivative of the function f, is shown below. On which of the following intervals is f decreasing?

a) [2, 4] only b) [3, 5] only c) [0, 1] and [3, 5] d) [2, 4] and [6, 7]

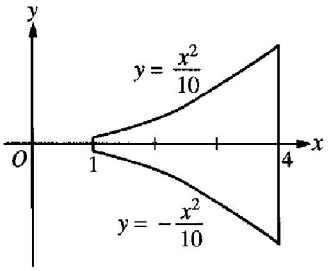
e) [0, 2] and [4, 6]

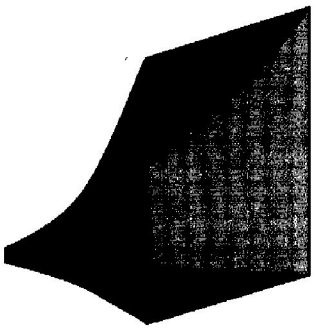


Graph of f'

85.

The base of a loudspeaker is determined by the two curves $y = \frac{x^2}{10}$ and $y = -\frac{x^2}{10}$ for $1 \le x \le 4$, as shown in the figure at the right. For this loudspeaker, the cross-sections perpendicular to the x-axis are squares. What is the volume of the loudspeaker, in cubic units?





a) 2.046 b) 4.092 c) 4.200 d) 8.184 e) 25.711

86.

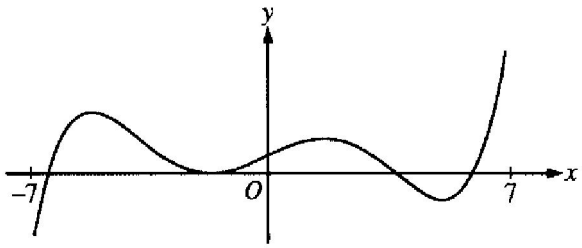
x	3	4	5	6	7
$f(x)$	20	17	12	16	20

The function f is continuous and differentiable on the closed interval [3, 7]. The table above gives selected values of f on this interval. Which of the following statements must be true?

I. The minimum value of f on [3, 7] is 12.
II. There exists c, for 3 < c < 7, such that $f'(c) = 0$.
III. $f'(x) > 0$ for 5 < x < 7.

a) I only b) II only c) III only d) I and III only e) I, II and III

87.



Graph of f'

The figure above shows the graph of f', the derivative of the function f, on the open interval -7 < x < 7. If f' has four zeros on -7 < x < 7, how many relative maxima does f have on -7 < x < 7?

a) One b) Two c) Three d) Four e) Five

88. The rate at which water is sprayed on a field of vegetables is given by $R(t) = 2\sqrt{1+5t^3}$, where t is in minutes and R(t) is in gallons per minute. During the time interval $0 \le t \le 4$, what is the average rate of water flow, in gallons per minute?

a) 8.458 b) 13.395 c) 14.691 d) 18.916 e) 35.833

89.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	3	–2	–3	4

The table above gives values of the differentiable functions f and g and their derivatives at x = 1. If $h(x) = (2f(x)+3)(1+g(x))$, then $h'(1) =$

a) -28 b) -16 c) 40 d) 44 e) 47

90. The functions f and g are differentiable, and $f(g(x)) = x$ for all x. If f(3) = 8 and $f'(3) = 9$, what are the values of g(8) and $g'(8)$?

a) $g(8) = \frac{1}{3}$ and $g'(8) = -\frac{1}{9}$ b) $g(8) = \frac{1}{3}$ and $g'(8) = \frac{1}{9}$ c) $g(8) = 3$ and $g'(8) = -9$

d) $g(8) = 3$ and $g'(8) = -\frac{1}{9}$ e) $g(8) = 3$ and $g'(8) = \frac{1}{9}$

91. A particle moves along the x-axis so that its velocity at any time $t \geq 0$ is given by $v(t) = 5te^{-t} - 1$. At t = 0 the particle is at position x = 1. What is the total distance traveled by the particle from t = 0 to t = 4?

a) 0.366 b) 0.542 c) 1.542 d) 1.821 e) 2.821

92. Let f by the function with first derivative defined by $f'(x) = \sin(x^3)$ for $0 \leq x \leq 2$. At what value of x does f attain its maximum value on the closed interval $0 \leq x \leq 2$?

a) 0 b) 1.162 c) 1.465 d) 1.845 e) 2