

CALCULUS AB

PRACTICE EXAM

Section I, Part B

Time – 50 minutes

Number of questions – 17

A CALCULATOR IS REQUIRED ON THIS PART OF THE EXAM.

1. 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) 74.680 (E) 133.417

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

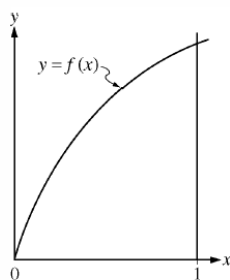
(A) 10 (B) 20 (C) 23 (D) 35 (E) 50

3. For $t \geq 0$ hours, H is a differentiable function of t 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 24th hour
(C) The average rate at which the temperature changed during the 24th 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 24th hour

4. 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 the rate of $9 \sin(\sqrt{t+1})$ 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



5. 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 above. 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

6. 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) 3 (B) 4 (C) 5 (D) 6 (E) 7

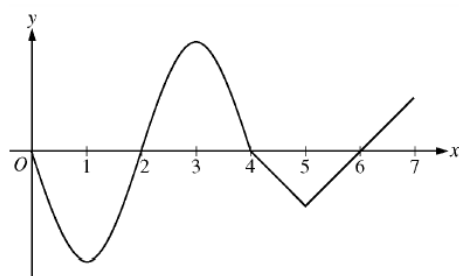
7. If f is a continuous function on the closed interval $[a, b]$, which of the following must be true?

- (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 open 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 $f'(c) = \frac{f(b) - f(a)}{b - a}$.

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

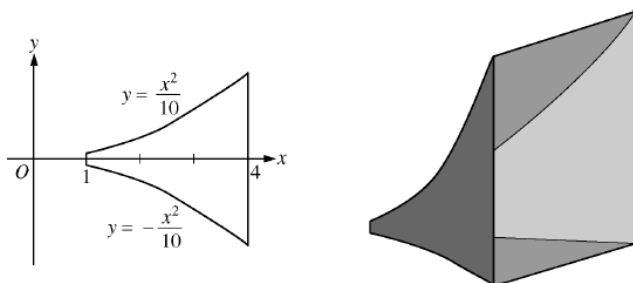
8. The function f is differentiable and has values as shown in the table above. Both f and f' are strictly increasing on the interval $0 \leq x \leq 5$. Which of the following could be the value of $f'(3)$?

(A) 20 (B) 27.5 (C) 29 (D) 30 (E) 30.5



Graph of f'

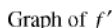
9. The graph of f' , the derivative of the function f , is shown above. On which of the following intervals is f decreasing?
- (A) $[2, 4]$ only
 (B) $[3, 5]$ only
 (C) $[0, 1]$ and $[3, 5]$
 (D) $[2, 4]$ and $[6, 7]$
 (E) $[0, 2]$ and $[4, 6]$



10. The base of a loudspeaker is determined by the two curves $y = \frac{x^2}{10}$ and $y = -\frac{x^2}{10}$ for $1 \leq x \leq 4$, as shown above. 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

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

11. The function f is continuous and differentiable on the closed interval $[3, 7]$. The table 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



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

(A) 8.458 (B) 13.395 (C) 14.691 (D) 18.916 (E) 35.833

- (A) 0 (B) 1.162 (C) 1.465 (D) 1.845 (E) 2