

1996: AB-2

①

Let R be the region in the first quadrant under the graph of $y = \frac{1}{\sqrt{x}}$ for $4 \leq x \leq 9$.

- (a) Find the area of R .
- (b) If the line $x = k$ divides the region R into two regions of equal area, what is the value of k ?
- (c) Find the volume of the solid whose base is the region R and whose cross sections cut by planes perpendicular to the x -axis are squares.

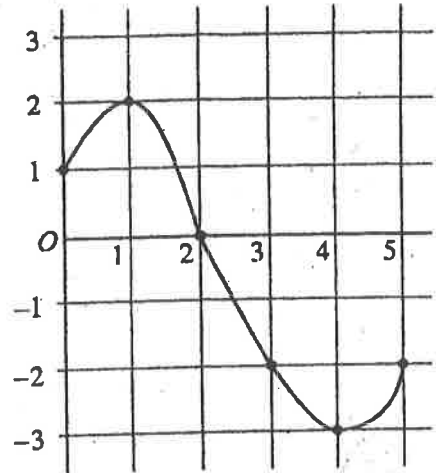
1995 - BC6

6. Let f be a function whose domain is the closed interval $[0, 5]$. The graph of f is shown below.

②

Let $h(x) = \int_0^{x+3} f(t) dt$.

- (a) Find the domain of h .
- (b) Find $h'(2)$.
- (c) At what x is $h(x)$ a minimum? Show the analysis that leads to your conclusion.



Graph of f

1995 - AB3

③

3. Consider the curve defined by $-8x^2 + 5xy + y^3 = -149$

- (a) Find $\frac{dy}{dx}$.
- (b) Write an equation for the line tangent to the curve at the point $(4, -1)$.
- (c) There is a number k so that the point $(4.2, k)$ is on the curve. Using the tangent line found in part (b), approximate the value of k .
- (d) Write an equation that can be solved to find the actual value of k so that the point $(4.2, k)$ is on the curve.
- (e) Solve the equation found in part (d) for the value of k .

1995 - AB2

④

2. A particle moves along the y -axis so that its velocity at any time $t \geq 0$ is given by $v(t) = t \cos t$. At time $t = 0$, the position of the particle is $y = 3$.
- (a) For what values of t , $0 \leq t \leq 5$, is the particle moving upward?
 - (b) Write an expression for the acceleration of the particle in terms of t .
 - (c) Write an expression for the position $y(t)$ of the particle.
 - (d) For $t > 0$, find the position of the particle the first time the velocity of the particle is zero.

1989 - BC 1

⑤

1. Let f be a function such that $f''(x) = 6x + 8$.
- (a) Find $f(x)$ if the graph of f is tangent to the line $3x - y = 2$ at the point $(0, -2)$.
 - (b) Find the average value of $f(x)$ on the closed interval $[-1, 1]$.

1988 - AB 6

6. Let f be a differentiable function, defined for all real numbers x , with the following properties.

(i) $f'(x) = ax^2 + bx$

(ii) $f'(1) = 6$ and $f''(1) = 18$

(iii) $\int_1^2 f(x) dx = 18$

Find $f(x)$. Show your work.

1988 - AB 2

2. A particle moves along the x -axis so that its velocity at any time $t \geq 0$ is given by $v(t) = 1 - \sin(2\pi t)$.

(a) Find the acceleration $a(t)$ of the particle at any time t .

(b) Find all values of t , $0 \leq t \leq 2$, for which the particle is at rest.

(c) Find the position $x(t)$ of the particle at any time t if $x(0) = 0$.

1987 - AB 3

3. Let R be the region enclosed by the graphs of $y = (64x)^{\frac{1}{4}}$ and $y = x$.

(a) Find the volume of the solid generated when region R is revolved about the x -axis.

(b) Set up, but do not integrate, an integral expression in terms of a single variable for the volume of the solid generated when region R is revolved about the y -axis.

1990 - AB 6

6. Let f be the function that is given by $f(x) = \frac{ax + b}{x^2 - c}$ and that has the following properties:

(i) The graph of f is symmetric with respect to the y -axis.

(ii) $\lim_{x \rightarrow 2^+} f(x) = +\infty$

(iii) $f'(1) = -2$

(a) Determine the values of a , b , and c .

(b) Write an equation for each vertical and each horizontal asymptote of the graph of f .

(c) Sketch the graph of f in the xy -plane provided below.