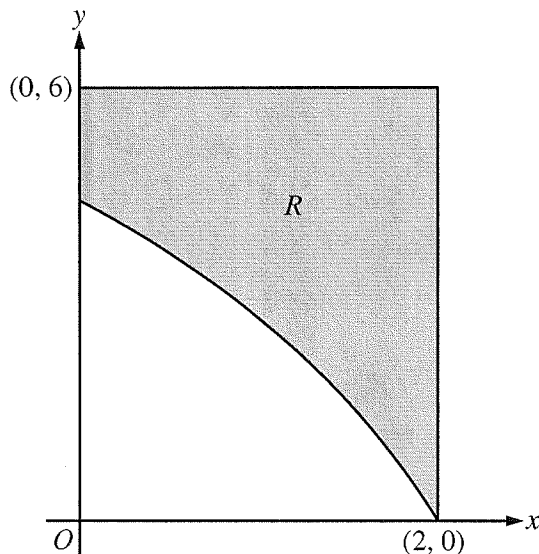


CALCULUS AB
SECTION II, Part A
Time—45 minutes
Number of problems—3

A graphing calculator is required for some problems or parts of problems.



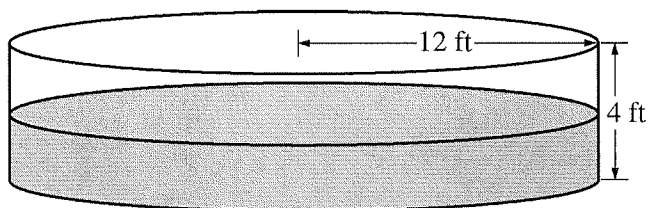
1. In the figure above, R is the shaded region in the first quadrant bounded by the graph of $y = 4\ln(3 - x)$, the horizontal line $y = 6$, and the vertical line $x = 2$.
- (a) Find the area of R .
- (b) Find the volume of the solid generated when R is revolved about the horizontal line $y = 8$.
- (c) The region R is the base of a solid. For this solid, each cross section perpendicular to the x -axis is a square. Find the volume of the solid.

WRITE ALL WORK IN THE EXAM BOOKLET.

2010 AP[®] CALCULUS AB FREE-RESPONSE QUESTIONS (Form B)

2. The function g is defined for $x > 0$ with $g(1) = 2$, $g'(x) = \sin\left(x + \frac{1}{x}\right)$, and $g''(x) = \left(1 - \frac{1}{x^2}\right)\cos\left(x + \frac{1}{x}\right)$.
- Find all values of x in the interval $0.12 \leq x \leq 1$ at which the graph of g has a horizontal tangent line.
 - On what subintervals of $(0.12, 1)$, if any, is the graph of g concave down? Justify your answer.
 - Write an equation for the line tangent to the graph of g at $x = 0.3$.
 - Does the line tangent to the graph of g at $x = 0.3$ lie above or below the graph of g for $0.3 < x < 1$? Why?

| | | | | | | | |
|--------|---|----|----|----|----|----|----|
| t | 0 | 2 | 4 | 6 | 8 | 10 | 12 |
| $P(t)$ | 0 | 46 | 53 | 57 | 60 | 62 | 63 |



3. The figure above shows an aboveground swimming pool in the shape of a cylinder with a radius of 12 feet and a height of 4 feet. The pool contains 1000 cubic feet of water at time $t = 0$. During the time interval $0 \leq t \leq 12$ hours, water is pumped into the pool at the rate $P(t)$ cubic feet per hour. The table above gives values of $P(t)$ for selected values of t . During the same time interval, water is leaking from the pool at the rate $R(t)$ cubic feet per hour, where $R(t) = 25e^{-0.05t}$. (Note: The volume V of a cylinder with radius r and height h is given by $V = \pi r^2 h$.)
- Use a midpoint Riemann sum with three subintervals of equal length to approximate the total amount of water that was pumped into the pool during the time interval $0 \leq t \leq 12$ hours. Show the computations that lead to your answer.
 - Calculate the total amount of water that leaked out of the pool during the time interval $0 \leq t \leq 12$ hours.
 - Use the results from parts (a) and (b) to approximate the volume of water in the pool at time $t = 12$ hours. Round your answer to the nearest cubic foot.
 - Find the rate at which the volume of water in the pool is increasing at time $t = 8$ hours. How fast is the water level in the pool rising at $t = 8$ hours? Indicate units of measure in both answers.

WRITE ALL WORK IN THE EXAM BOOKLET.

END OF PART A OF SECTION II