

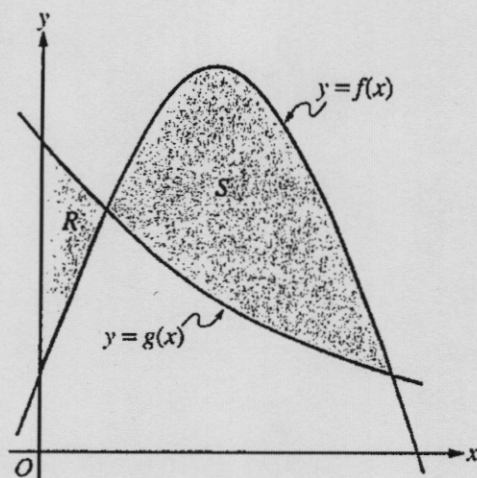
2005 AP[®] CALCULUS AB FREE-RESPONSE QUESTIONS

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. Let f and g be the functions given by $f(x) = \frac{1}{4} + \sin(\pi x)$ and $g(x) = 4^{-x}$. Let R be the shaded region in the first quadrant enclosed by the y -axis and the graphs of f and g , and let S be the shaded region in the first quadrant enclosed by the graphs of f and g , as shown in the figure above.
- Find the area of R .
 - Find the area of S .
 - Find the volume of the solid generated when S is revolved about the horizontal line $y = -1$.

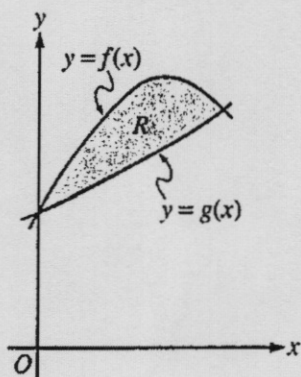
2005 AP[®] CALCULUS AB FREE-RESPONSE QUESTIONS (Form B)

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.



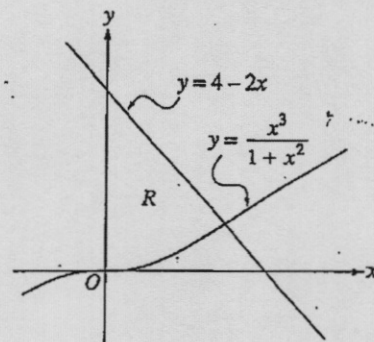
2. Let f and g be the functions given by $f(x) = 1 + \sin(2x)$ and $g(x) = e^{x/2}$. Let R be the shaded region in the first quadrant enclosed by the graphs of f and g as shown in the figure above.
- Find the area of R .
 - Find the volume of the solid generated when R is revolved about the x -axis.
 - The region R is the base of a solid. For this solid, the cross sections perpendicular to the x -axis are semicircles with diameters extending from $y = f(x)$ to $y = g(x)$. Find the volume of this solid.

Please do the following practice free response AP problems. Questions 1-3 allow the use of a graphing calculator and questions 4-7 do NOT.

3) Let R be the region bounded by the y -axis and the graphs of

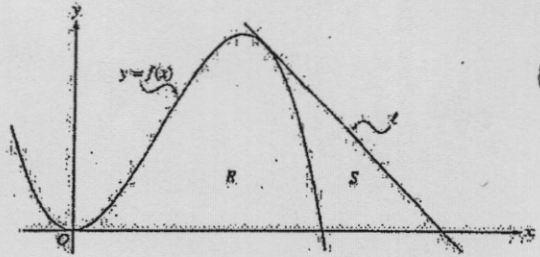
$$y = \frac{x^3}{1+x^2} \text{ and } y = 4 - 2x, \text{ as shown in the figure above.}$$

- Find the area of R .
- Find the volume of the solid generated when R is revolved about the x -axis.
- 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 this solid.



9)

Let f be the function given by $f(x) = 4x^2 - x^3$, and let ℓ be the line $y = 18 - 3x$, where ℓ is tangent to the graph of f . Let R be the region bounded by the graph of f and the x -axis, and let S be the region bounded by the graph of f , the line ℓ , and the x -axis, as shown above.



- (a) Show that ℓ is tangent to the graph of $y = f(x)$ at the point $x = 3$.
- (b) Find the area of S .
- (c) Find the volume of the solid generated when R is revolved about the x -axis.