

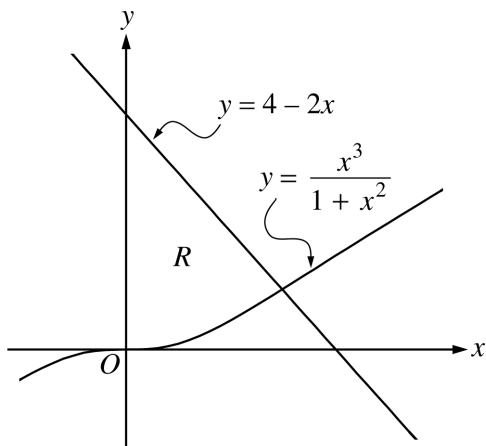
2002 AP[®] CALCULUS AB FREE-RESPONSE QUESTIONS (Form B)

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.



1. Let R be the region bounded by the y -axis and the graphs of $y = \frac{x^3}{1 + x^2}$ and $y = 4 - 2x$, as shown in the figure above.
 - (a) Find the area of R .
 - (b) Find the volume of the solid generated when R is revolved about the x -axis.
 - (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 this solid.
2. The number of gallons, $P(t)$, of a pollutant in a lake changes at the rate $P'(t) = 1 - 3e^{-0.2\sqrt{t}}$ gallons per day, where t is measured in days. There are 50 gallons of the pollutant in the lake at time $t = 0$. The lake is considered to be safe when it contains 40 gallons or less of pollutant.
 - (a) Is the amount of pollutant increasing at time $t = 9$? Why or why not?
 - (b) For what value of t will the number of gallons of pollutant be at its minimum? Justify your answer.
 - (c) Is the lake safe when the number of gallons of pollutant is at its minimum? Justify your answer.
 - (d) An investigator uses the tangent line approximation to $P(t)$ at $t = 0$ as a model for the amount of pollutant in the lake. At what time t does this model predict that the lake becomes safe?