AP® Calculus AB
2000 Scoring Commentary

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Question 1

General Commentary

This problem required the student to use definite integrals in computing the area of a region R and the volumes of two solids with known cross sections. One solid was obtained by revolving the region R about the x-axis (a solid of revolution having circular cross sections) and the other solid had base R with square cross sections perpendicular to the x-axis. The student needed to use a calculator equation-solver (numerical or graphical) to determine the intersection of two curves that bound the region. The calculator was also needed to compute all three definite integrals arising in this problem.

Question 2

General Commentary

This problem presented the student with the velocity functions for two runners, Runner A and Runner B. Runner A's velocity was represented graphically, while Runner B's velocity was represented analytically as an algebraic function. The three parts of the problem asked the student to answer parallel questions for both runners – (a) velocity at a given time, (b) acceleration at a given time, and (c) distance traveled over a given time interval – all with appropriate units of measurement. This problem required students to demonstrate their understanding of basic differential and integral calculus concepts in multiple representations, a relatively new emphasis in the AP Calculus Course Description.

Question 3

General Commentary

This problem presented the student with the graph of a derivative of the function f, along with information about the locations of the horizontal and vertical tangents to the derivative graph. The student was asked to answer questions about the relative and absolute extrema of the "parent" function f and about values where f'' is negative. Mathematically sound justifications for the locations of the extrema were needed to earn full credit on this problem. Justifying that the absolute maximum of f occurs at the right endpoint of the closed interval required an especially careful argument by the student in interpreting the area between the graph of f' and the x-axis as quantifying the accumulated change in the value of $f(x)$.

Question 4

General Commentary

General Commentary This problem asked the student to apply calculus in the context of quantifying the volume of water in an underground tank. The student was presented with the following information: an initial amount of water in the tank, a constant rate of inflow, and a variable rate of outflow (leakage) of water from the tank relative to time. The introductory parts of the problem asked the student to find the amount of water that had leaked from the tank and the total amount of water in the tank at a specific time. The problem proceeded to ask for a general model for the amount of water in the tank at time t and for the exact time at which this amount was a maximum.

Question 5

General Commentary

This problem was relatively straightforward and presented the student with a curve described by a relation in terms of x and y. The first part of the problem asked for a verification of an algebraic expression for dy/dx found by implicit differentiation. The student then had to make use of this derivative expression and the original relation in determining the equations and locations of various tangent lines to the curve. Note that this problem required the student to solve some simple algebraic equations without the use of a calculator.

Question 6

General Commentary

This problem presented the student with a separable differential equation. Part (a) of the problem asked for a solution satisfying a given initial condition. In solving this differential equation, the student needed to perform some simple antidifferentiations without the use of a calculator and correctly handle the constants of integration that arose in order to find a solution that satisfied the initial condition. The concluding part of the problem asked the student for both the domain and range of the particular solution (involving a logarithmic function) found in part (a).