

**AP<sup>®</sup> CALCULUS AB**  
**2008 SCORING GUIDELINES (Form B)**

**Question 1**

Let  $R$  be the region in the first quadrant bounded by the graphs of  $y = \sqrt{x}$  and  $y = \frac{x}{3}$ .

- (a) Find the area of  $R$ .
- (b) Find the volume of the solid generated when  $R$  is rotated about the vertical line  $x = -1$ .
- (c) The region  $R$  is the base of a solid. For this solid, the cross sections perpendicular to the  $y$ -axis are squares. Find the volume of this solid.

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The graphs of  $y = \sqrt{x}$  and  $y = \frac{x}{3}$  intersect at the points  $(0, 0)$  and  $(9, 3)$ .

(a)  $\int_0^9 \left( \sqrt{x} - \frac{x}{3} \right) dx = 4.5$

OR

$$\int_0^3 (3y - y^2) dy = 4.5$$

(b)  $\pi \int_0^3 \left( (3y + 1)^2 - (y^2 + 1)^2 \right) dy$   
 $= \frac{207\pi}{5} = 130.061$  or  $130.062$

(c)  $\int_0^3 (3y - y^2)^2 dy = 8.1$

$$3 : \begin{cases} 1 : \text{limits} \\ 1 : \text{integrand} \\ 1 : \text{answer} \end{cases}$$

$$4 : \begin{cases} 1 : \text{constant and limits} \\ 2 : \text{integrand} \\ 1 : \text{answer} \end{cases}$$

$$2 : \begin{cases} 1 : \text{integrand} \\ 1 : \text{limits and answer} \end{cases}$$