AP Calculus
7.3 Worksheet (Day 2)

All work must be shown in this course for full credit. Unsupported answers may receive NO credit.

1. Suppose region R is in the first quadrant bounded by the graphs of $y = \sqrt[3]{x}$ and $x = 8$.

    a) If R is rotated about the x-axis find the resulting volume.

    b) Find the volume if R is rotated around the line $x = 8$.

2. The region in the first quadrant bounded by the graph of $y = \sec x$, $x = \frac{\pi}{4}$, and the axes is rotated about the x-axis. What is the volume of the solid generated?

A) $\frac{\pi^2}{4}$

B) $\pi - 1$

C) π

D) 2π

E) $\frac{8\pi}{3}$

3. The volume of the solid obtained by revolving the region enclosed by the ellipse $x^2 + 9y^2 = 9$ about the x-axis is
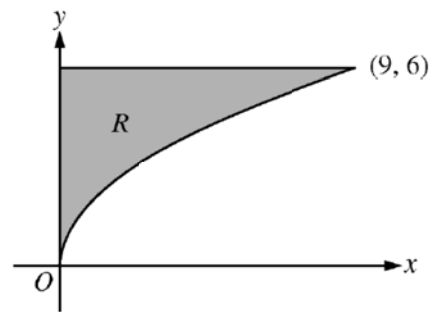
A) 2π

B) 4π

C) 6π

D) 9π

E) 12π

4. Let R be the region in the first quadrant bounded by the graph of $y = 2\sqrt{x}$, the horizontal line $y = 6$, and the y-axis, as shown in the figure above.


(9, 6)

R

a) Find the area of R.

     b) Write, but do not evaluate, an integral expression that gives the volume of the solid generated when R is rotated about the horizontal line $y = 6$.

     c) Region R is the base of a solid. For each y, where $0 \le y \le 6$, the cross section of the solid taken perpendicular to the y-axis is a rectangle whose height is 3 times the length of its base in region R. Write, but do not evaluate, an integral expression that gives the volume of the solid.

5. [Calculator] 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 $x = 2$.

(0, 6)

R

(2, 0)
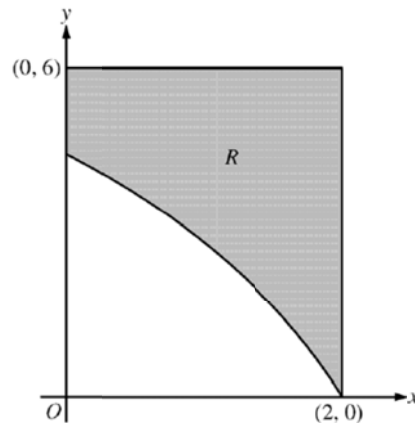
a) Find the area of R.

     b) Find the volume of the solid generated when R is revolved about the horizontal line $y = 6$.

     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.

6. [Calculator] The rate at which people enter an auditorium for a rock concert is modeled by the function R given by $R(t) = 1380t^2 - 675t^3$ for $0 \le t \le 2$ hours; $R(t)$ is measured in people per hour. No one is in the auditorium at time $t = 0$, when the doors open. The doors close and the concert begins at time $t = 2$.

a) How many people are in the auditorium when the concert begins?

b) Find the time when the rate at which people enter the auditorium is a maximum. Justify your answer.

c) The total wait time for all the people in the auditorium is found by adding the time each person waits, starting at the time the person enters the auditorium and ending when the concert begins. The function w models the total wait time for all the people who enter the auditorium before time t. The derivative of w is given by $w'(t) = (2-t)R(t)$. Find $w(2) - w(1)$, the total wait time for those who enter the auditorium after time $t = 1$.

d) On average, how long does a person wait in the auditorium for the concert to begin? Consider all people who enter the auditorium after the doors open, and use the model for total wait time from part c.