AP Calculus Name:_____

Unit 7 Test – 80 points

1. For this problem, you should graph the region enclosing the given curves and the reflected region for each part. Then find the volume of the solid formed if the region is rotated around the given line. You must write the integral representing the volume. Then you may use the calculator to evaluate the integral. Also, make sure you define *R* and, if necessary, *r.* (6 points each)

Given curves: $y = x^3, y = 0, x = 2$

a. Rotate about the *x*-axis

b. Rotate about the line $y = -1$

c. Rotate about the line $x = 4$

2. Find the volume of the solid whose base is bounded by the circle whose center is the origin with radius 8 and the indicated cross-sections taken perpendicular to the *x*-axis. Show the integral setup, then you may use the calculator to evaluate the integral. (13 points)

a. equilateral triangles

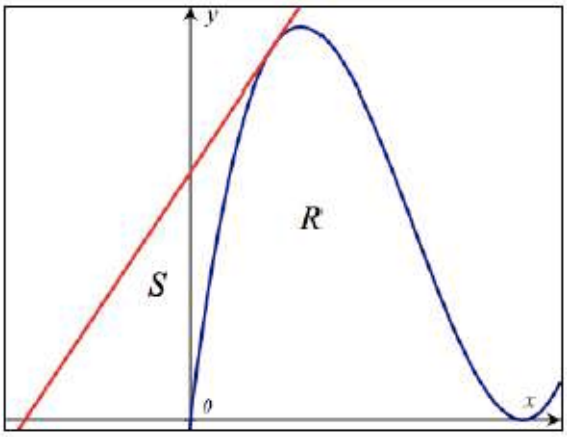
b. squares

3. A pie dish is 9 inches across the top, 7 inches across the bottom, and 3 inches deep. Calculate the volume of the dish. Draw a picture and show all work. **HINT:** define the radius in terms of the height… think "linear" (6 points)

4. The circumference of a tree at different heights above the ground is given in the table below. Assume that all horizontal cross-sections of the tree are circles. Estimate the volume of the tree. Show all work. (8 points)

Height (inches)	0	20	40	60	80	100	120
Circumference (inches)	31	28	21	17	12	8	2

5. Let f be the function given by $f(x) = x^3 - 16x^2 + 64x$ and let line l be the line tangent to the graph of f at $x = 2$, as shown in the figure below. 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, line l, and the x-axis.



a. Find the equation of line l. (3 points)

b. Find the area of region S. (6 points)

c. Region R is the base of a solid. The cross-sections of the solid taken perpendicular to the x-axis are semicircles. What is the volume of the solid? (8 points)

d. If region S is rotated around the line $x = 2$, what is the volume of the solid generated by this rotation? (8 points)

6. Let R be the region in the first quadrant enclosed by the graph of $y = \sqrt{6x+4}$, the line $y = 2x$ and the y-axis.

a. Find the area of R. (4 points)

b. Set up, but do not solve, an integral expression in terms of a single variable for the volume of the solid generated when R is revolved about the x-axis. (3 points)

c. Set up, but do not solve, an integral expression in terms of a single variable for the volume of the solid generated when R is revolved about the y-axis. (3 points)