

Homework #3: Sections 6.1, 6.2, and 6.3

Complete each question below. Answers should be carefully written up, showing all necessary work for each step to complete each problem. Your turned-in work should be neat and legible. If I cannot understand or follow your work you will not get credit for it. You may discuss these problems with myself, the TAs and Math Center tutors, and your classmates, but once you start writing up the problem to turn in, you must complete the write-up on your own. This assignment is out of **36 points**. It is due at the **start of class on Tuesday, September 15**.

- (5 points) Find the area of the region bounded by the parabola $y = x^2$, the tangent line to this curve at the point $(2, 4)$, and the y -axis.
- (5 points) Find the area between the curves $x = y^3 - y$ and $x = 8y$.
- Find the volume of the region generated by rotating the curves $y = \sqrt[3]{x}$, $y = 2$, and the y -axis around
 - (4 points) The y -axis.
 - (4 points) The x -axis.
 - (4 points) The line $x = -1$.
- Consider the following integral:

$$V = \pi \int_{-1}^3 4 \cos^2\left(\frac{\pi x}{12}\right) - \frac{1}{1+x^2} dx.$$

- (3 points) Describe the region which this integral finds the volume of, in words.
 - (4 points) Use the midpoint rule and 4 rectangles to estimate the volume of this region.
- (7 points) Suppose you have a sphere of radius R , and you drill a cylindrical hole through the center of it with a radius of r . Sketch the shape, and include in your sketch a typical area slice for the method you chose. Then find the volume of the shape. (Hint: A circle of radius R satisfies the equation $x^2 + y^2 = R^2$.)