

Math 132: Calculus for Physical and Life Sciences 2
Problem Set 6
Due Friday, March 14, 2008, at the beginning of class.

General Directions: You must show all work for credit on these problems.

- Find the volume of the solid obtained by rotating the region bounded by the given curves about the specified line. Sketch the region, the solid, and a typical disk or washer.
 - $y = x^2 + 2$, $x = 1$, $x = 2$, $y = 0$; about the x -axis
 - $y = \frac{1}{2}x + 3$, $y = x^2$; about the x -axis
 - $y = \sin x$, $x = 0$, $x = \pi$, $y = 0$; about the line $y = 2$
 - $y = x^3$, $y = \sqrt{x}$, $x = 0$, $x = 1$; about the x -axis
 - $y = \frac{1}{x}$, $y = x$, $y = 2x$ for $x > 0$; about the x -axis
 - $x = 4 - y^2$, $x = y^2$; about the y -axis
 - $x = \frac{1}{y}$, $y = 4$, $x = 2$; about the y -axis
- The base of a certain solid is the circle $x^2 + y^2 = 9$ and each cross section perpendicular to the x -axis is an equilateral triangle with one side across the base. Find the volume of the solid.
- A nose cone for a space reentry vehicle is designed so that a cross section, taken x feet from the the tip and perpendicular to the axis of symmetry, is a circle of radius $\frac{1}{4}x^2$ ft. Find the volume of the nose cone given that its length is 20 ft.
- Graph the curve and find its exact length.
 - $x = 4t + 3$, $y = 3t - 2$, $0 \leq t \leq 2$
 - $x = \frac{1}{3}t^3$, $y = \frac{1}{2}t^2$, $0 \leq t \leq 1$
 - $x = 3 \sin(2t)$ and $y = 3 \cos(2t)$, $0 \leq t \leq \frac{\pi}{2}$
 - $y = 3x^2 + 2$ and $2 \leq x \leq 4$
- Use Simpson's Rule with $n = 10$ to estimate the arc length of the curve $y = \ln x$ for $1 \leq x \leq 4$.
- Find the average value of the function on the given interval.

(a) $y = x \cos(3x)$, $[0, \pi]$

(b) $y = x\sqrt{1 + 3x^2}$, $[1, 3]$

7. Find the number b such that the average value of $f(x) = x^3 - 1$ on the interval $[0, b]$ is equal to 6.
8. The amount of a certain drug present in a patient's body for the first 4 days after the drug has been administered is

$$C(t) = 5e^{-0.2t}$$

units. Determine the average amount of the drug present in the patient's body for the first 4 days after the drug has been administered.