

NAME \_\_\_\_\_

Math 181: Calculus II

**SAMPLE Hour Exam 2**

(actually given 17 April 1998)

All 5 problems are worth 20 points. Remember to SHOW ALL WORK.

1) After Mt. St. Helens erupted in 1980, it was found that ash was spread in decreasing density as a function of the distance  $r$  from the center of the crater. Say the density  $\rho$  at distance  $r$  (meters) from the center of the crater is given by

$$\rho = \frac{2000 \text{ kg}}{1 + r^3 \text{ m}^2}.$$

- (a) What is the approximate area between radius  $r$  and radius  $r + \Delta r$ ?
- (b) What is the approximate mass of ash between these two radii?
- (c) Evaluate a definite integral to find the total mass of ash within 1000 meters of the crater.

2) Find the volume of the pointy cone obtained by rotating the region bounded by the  $x$ -axis, the curve  $y = x^{3/2}$ , and the line  $x = 4$ —about the  $x$ -axis.

3) A circular window 4 feet in diameter looks into a large aquarium. Find the force of the water on the window, assuming the level of the surface of the water passes through the center of the window. Recall that the pressure of the water on the glass at a depth of  $y$  feet below the surface is  $62.4 y$  lb/ft<sup>2</sup>.

4) The probability distribution  $p(x)$  is given by  $1/7$  for  $x$  in  $[0, 3)$ , and by  $4/7$  for  $x$  in  $[3, 4]$ ; it is 0 for any other  $x$ .

- (a) What two properties of  $p$  make it a probability density?
- (b) What is the probability that  $x$  lies between 0 and 2 ?
- (c) What is the median value of  $x$  ?
- (d) What is the mean value of  $x$  ?

5) Find the kinetic energy of a disk 12 cm in diameter, 1 cm thick, spinning at 10 revolutions per second, about an axis perpendicular to the disk and passing through its center. The mass of the disk is 500 g.