

# Homework: Volumes and Center of Mass

## Calculus II, Math 112

Name: \_\_\_\_\_

### More on Volumes

You may use Maple or a calculator to evaluate the integrals once you've set them up.

1. Find the volume of the solid generated by revolving the region between the curves  $y = x$  and  $y = \sqrt{x}$  about the given axis.

(a)  $y = 1$

(b)  $y = -2$

(c)  $x = 2$

(d)  $x = -3$

2. Derive formulas for the volumes of the following solids:

(a) A right circular cone with height  $h$  and radius (of the base)  $r$ .

(b) The "cap" of a sphere resulting from slicing a sphere of radius  $r$  at a distance  $h$  from its center.

### Center of Mass

3. The masses  $m_i$  are located at the points  $P_i$ . Find the moments  $M_x$  and  $M_y$  and the center of mass of the system  $(\bar{x}, \bar{y})$ .

$$m_1 = 6, m_2 = 5, m_3 = 1, m_4 = 4.$$

$$P_1 = (1, -2), P_2 = (3, 4), P_3 = (-3, -7), P_4 = (6, -1).$$

4. Sketch the region bounded by the curves, and visually estimate the location of the centroid. Then find the exact coordinates of the centroid. You may use Maple to compute the integrals for these problems.

(a)  $y = \sqrt{x}, y = 0, x = 9$ .

(b)  $y = \frac{1}{x}, y = 0, x = 1, x = 2$ .

(c)  $y = \sin(x), y = \cos(x), x = 0, x = \frac{\pi}{4}$ .

(d)  $y = x, y = \frac{1}{x}, y = 0, x = 2$ .

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<sup>0</sup>Parts of this worksheet are adapted from a worksheet created by Carol Schumacher.