

- (1) Book section 16.5: 20, 54, 63.
- (2) Consider a homogeneous hemispherical shell
$$R^2 \leq x^2 + y^2 + z^2 \leq 1, \quad z \geq 0$$
where  $0 \leq R < 1$  is fixed. Find the center of mass.
- (3) Consider a glass beaker 100mm tall, with an exterior radius of 50mm. The bottom and sides are 5mm thick and the glass has density  $2500 \text{ kg/m}^3$ . Find the center of mass and the moment of inertia about the axis of symmetry.
- (4) Given  $a, b > 0$ , determine the center of mass of a homogeneous triangle with vertices  $(0, 0)$ ,  $(1, 0)$ , and  $(a, b)$ . Verify algebraically that it lies at the intersection of the medians.
- (5) Determine the center of mass of the homogeneous sector  $0 \leq \theta \leq \pi/6$ ,  $0 \leq r \leq 1$ . Determine the moment of inertia of the sector for rotations about the axis passing through the center of mass and perpendicular to the plane of the sector.
- (6) The point  $(X, Y)$  is randomly distributed in the region  $x \geq 0$ ,  $y \geq 0$  according to the following probability density:
$$p(x, y) = e^{-x-y}$$
  - (a) What is the probability that  $X \leq Y$ ?
  - (b) Compute the median of  $X/Y$ .
  - (c) Compute the probability that  $|X - Y| \leq 1$ .