

# MATH 13, FALL '16

## HOMEWORK 4

Due Wednesday, October 12

Write your answers neatly and clearly. Use complete sentences, and label any diagrams. List problems in numerical order and staple all pages together. Start each problem on a new page. Please show your work; no credit is given for solutions without work or justification.

Remember that you may discuss the problems with classmates, but all work should be your own. List the names of anybody with whom you discussed the problems at the top of the page.

1. Find the mass and center of mass of the solid cube  $\mathcal{W} = [0, C] \times [0, C] \times [0, C]$  with density  $\rho(x, y, z) = x^2 + y^2 + z^2$ .
2. Let  $\mathcal{D}$  be a two-dimensional region that occupies the region that lies outside the circle  $x^2 + y^2 = 1$  and inside the circle  $x^2 + y^2 = 2y$ . Suppose this region has density function  $\delta(x, y) = \frac{k}{\sqrt{x^2 + y^2}}$ . (In other words, the density is inversely proportional to the distance from the origin.) What is the center of mass?
3. Let  $\mathcal{R}$  be the parallelogram with vertices  $(-1, 3), (1, -3), (3, -1), (1, 5)$ . Use the transformation  $x = \frac{u+v}{4}$  and  $y = \frac{v-3u}{4}$  to calculate  $\iint_{\mathcal{R}} (4x + 8y) dA$ .
4. Let  $\mathcal{R}$  be the region bounded by the curves  $xy = 1, xy = 2, xy^2 = 1,$  and  $xy^2 = 2$ . Graph the region (you may use a computer to help). Use the transformation  $u = xy$  and  $v = xy^2$  to calculate  $\iint_{\mathcal{R}} y^2 dA$ .