Math 53 Homework 8

Due Wednesday 3/16/16 in section

(The problems in parentheses are for extra practice and optional. Only turn in the underlined problems.)

Monday 3/7 – Double integrals

- **Read:** sections 15.1, 15.2 (6th/7th eds: 15.1, 15.2, 15.3).
- **Work:** 15.1: (21), 24, 29, 32, (36), (37), (43).[1]

  Problem 1 below.

  15.2: (1), (7), (17), (25), 27, (39), (46), (48), 51, 53, (61), 64.[2]

Wednesday 3/9 – Double integrals in polar coordinates

- **Read:** section 15.3 (6th/7th eds: 15.4).
- **Work:** 15.3: (6), (7), 11, 13, 15, (17), (22), 25, (27), (29), 31, (39), 40.[3]

Friday 3/11 – Applications of double integrals

- **Read:** section 15.4 (6th/7th eds: 15.5).
- **Work:** 15.4: (3), 10, (11), 12 + find the moments of inertia I_x, I_y, I_0, (27), 28.[4]

  Problems 2 and 3 below.

Problem 1. Evaluate the following double integrals:

a) $\displaystyle\int_0^1 \int_{x^2}^{x} (1+2y)\,dy\,dx,$

b) $\displaystyle\iint_D \frac{y}{x^5+1}\,dA, \quad D = \{(x,y)\,|\,0 \le x \le 1,\ 0 \le y \le x^2\},$

c) $\displaystyle\iint_D 2xy\,dA, \quad D$ is the triangular region with vertices (0,0), (1,2), and (0,3).

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[1] **6th/7th eds:** 15.2: (9), 12, 17, 20, (24), (25), (31).

[2] **6th ed:** 15.3: (1), (7), (13), (21), 23*, (33), (39), (41), 45, 47**, (55), 58.
7th ed: 15.3: (1), (7), (17), (25), 27*, (37), (44), (46), 49, 51**, (59), 62.
* do the 8th edition problem: $2x + y + z = 4$.
** do the 8th edition problem: $\int_0^1 \int_{\sqrt{x}}^1 \sqrt{y^3+1}\,dy\,dx$.

[3] **6th ed:** 15.4: (6), (7), 11, 13, 15, (17), (22), 25, (27), (29), 31***, (35), 36.
7th ed: 15.4: (6), (7), 11, 13, 15, (17), (22), 25, (27), (29), 31***, (39), 40.
*** do the 8th edition problem: $\int_0^{1/2} \int_{\sqrt{3}y}^{\sqrt{1-y^2}} xy^2\,dx\,dy$.

[4] **6th/7th eds:** 15.5 (3), 10*, (11), 12 + 18, (27), 28
* do the 8th ed problem: D enclosed by curves $y = 0$ and $y = \cos x$, $-\pi/2 \le x \le \pi/2$; $\rho(x,y) = y$.

Problem 2. (The two parts are independent)

a) Show that the average distance of a point in a disk of radius a to the center of the disk is $2a/3$.

b) Find the average distance of a point in a disk of radius a to a fixed point on the circumference of the disk. (Hint: place the center of the disk at $(a, 0)$ and the given point on the circumference at the origin).

Problem 3.

a) Find the area of the region R bounded by the curve $r = \sin 2\theta$ in the first quadrant. (Do this as a double integral in polar coordinates.)

b) Find the coordinates $(\bar{x}, \bar{y})$ of its center of mass (take a uniform density $\rho = 1$). (Hint: it is helpful to rewrite the value of the inner integral as the product of $\sin\theta$ by an expression involving only cosines.)