

# Math 342, Fall 2024 — Homework 8

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Due November 8 at 5:00 pm

**Instructions.** This problem set contains problems from Week 9 of class. The problem numbers refer to our textbook, *Probability with Applications and R*, by Amy Wagaman and Robert Dobrow, 2nd edition.

**Problem 1.** Do the following textbook problems and submit on Gradescope: 6.2, 6.12, 6.16, 6.21, 6.22.

**Problem 2.** Let  $f : \mathbb{R}^2 \rightarrow \mathbb{R}$  be a given function where

$$\text{supp}(f) = \{(x, y) \in \mathbb{R}^2 : 0 < x < 2, 0 < y < 2\}$$

and define

$$B_1 = \{(x, y) \in \mathbb{R}^2 : 0.5 < x < 1.5, y > 1\}$$

$$B_2 = \{(x, y) \in \mathbb{R}^2 : 2x + y > 2\}$$

$$B_3 = \{(x, y) \in \mathbb{R}^2 : y < x^2\}.$$

- Sketch the intersection of each set  $B_i$  with  $\text{supp}(f)$ .
- Set up each double integral  $\iint_{B_i} f(x, y) dA$  in two ways: with  $dA = dydx$  and with  $dA = dxdy$ .

**Problem 3.** Let  $f : \mathbb{R}^2 \rightarrow \mathbb{R}$  be a given joint probability density function where

$$\text{supp}(f) = \{(x, y) \in \mathbb{R}^2 : x > 0, y > 0\}$$

and define

$$B_1 = \{(x, y) \in \mathbb{R}^2 : x < y\}$$

$$B_2 = \{(x, y) \in \mathbb{R}^2 : x > 3\}$$

$$B_3 = \{(x, y) \in \mathbb{R}^2 : x + y < 1\}.$$

- Sketch the intersection of each set  $B_i$  with  $\text{supp}(f)$ .
- Set up each double integral  $\iint_{B_i} f(x, y) dA$  in two ways: with  $dA = dydx$  and with  $dA = dxdy$ .
- Suppose  $f(x, y) = ce^{-2x}e^{-3y}$  on its support set. Find the value of  $c$ .

**Problem 4.** If you liked the problems above or want more practice, our textbook has more great problems. The odd-numbered ones have solutions in the back. Here are some that I recommend (as optional, not to be turned in): 6.11, 6.15, 6.18, 6.19, 6.23. Feel free to try others, including all the problems in the main sections, which include full explanations.