

1. Suppose that the random variables  $W, X, Y$ , and  $Z$  have PDF

$$f(w, x, y, z) = 16wxyz$$

on  $0 < w < 1, 0 < x < 1, 0 < y < 1, 0 < z < 1$ .

- Find the marginal distribution  $f(w, x)$ .
  - Find  $\mathbb{E}(XW)$ .
  - Find the expected value of  $X$ , namely  $\mathbb{E}(X)$ .
  - Are  $X$  and  $W$  independent?
  - Find  $\text{Cov}(X, W)$ .
2. Find  $P(X < 1 | y = 3/2)$  if  $X$  and  $Y$  have (joint) PDF

$$f(x, y) = xy/2$$

on  $0 \leq x \leq y \leq 2$ .

- To avoid detection at customs, a traveler places 6 narcotics tablets in a bottle containing 9 vitamin pills that are similar in appearance. If the customs official selects 3 of the tablets at random for analysis, what is the probability that the narcotics are found?
- A telephone solicitor is responsible for canvassing three suburbs. In the past, 60% of the completed calls to Belle Meade have resulted in donations, compared to 55% for Oak Hill and 35% for Antioch. Her list of telephone numbers includes one thousand households from Belle Meade, one thousand from Oak Hill, and two thousand from Antioch. Suppose that she picks a number at random from the list and places the call. What is the probability that she gets a donation?