

Math 130B

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Abstract

I'm writing these lecture notes for UC Irvine's Math 130B course, taught in the summer of 2022. This is a five-ish week course where I plan to get through chapters 6-8 of Ross' book [1]. The class structure consists of a two hour lecture followed by a one hour discussion section three days a week. I'm aiming to get through one or two sections of the book per lecture with a midterm soon after chapter 6, maybe partway into chapter 7.

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1 Jointly Distributed Random Variables

1.1 Joint Distribution Functions

Remember that every (real-valued) random variable X gives us a function $F_X : \mathbb{R} \rightarrow [0, 1]$ called its (*cumulative*) *distribution function*:

$$F_X(t) = \Pr[X \leq t]. \quad (1)$$

Likewise, if we have two random variables X and Y , we can define their *joint (cumulative) distribution function*.

Definition 1.1. Let X and Y be two random variables. Then their *joint cumulative distribution function*, $F : \mathbb{R}^2 \rightarrow [0, 1]$ is defined by

$$F(s, t) = \Pr[X \leq s, Y \leq t].$$

If there's any possibility for ambiguity, we might write $F_{X,Y}$ to remind us that F is the cumulative distribution function for X and Y .

References

- [1] Ross, Sheldon. *A First Course in Probability*. Ninth Edition. Pearson. 2014.