

UC Berkeley  
Department of Electrical Engineering and Computer Sciences

EECS 126: PROBABILITY AND RANDOM PROCESSES

**Discussion 03**

Spring 2024

1. **Expected Norm**

Pick two points  $X = (X_1, X_2)$  and  $Y = (Y_1, Y_2)$  independently and uniformly in  $[0, 1]^2$ . Calculate  $\mathbb{E}(\|X - Y\|_2^2)$ .

## 2. Minimum and Maximum of Exponentials

Let  $\lambda_1, \lambda_2 > 0$ , and  $X_1 \sim \text{Exponential}(\lambda_1)$ ,  $X_2 \sim \text{Exponential}(\lambda_2)$  are independent. Also, define  $U := \min(X_1, X_2)$  and  $V := \max(X_1, X_2)$ . Show that  $U$  and  $V - U$  are independent.

### 3. Poisson Recursion

Suppose that  $X$  is Poisson distributed with parameter  $\lambda$ . Show that  $\mathbb{E}(X^n) = \lambda \mathbb{E}((X+1)^{n-1})$ , and use this to compute  $\mathbb{E}(X^3)$ .