Lecture 5.1: Continuous Random Variables

2013/09/30

Announcement

- What: Brunch for women & female-identifying students interested in possibly majoring in mathematics or physics.
- When: Saturday, Oct 12 2013
- Who: Specifically women and female-identifying persons in mathematics and physics are invited. Male students are welcome to attend as well.
- Where: TBD

Contact Rachel Pincus `rpincus@reed.edu` for more info.

Previously... Poisson Distribution

A discrete random variable X is said to have the Poisson distribution with parameter $\mu > 0$ if

$$f(x) = \frac{\lambda^x e^{-\lambda}}{x!}$$

for $x = 0, 1, \ldots$ for $\lambda > 0$.

Goals for Today

- Probability density function
- Expected Value

From Lecture 3.3: Cumulative Distribution Function

The distribution function (AKA cumulative distribution function) of a random variable X is a function $F : \mathbb{R} \longrightarrow [0, 1]$ given by $F(x) = \mathbb{P}(X \leq x)$

A function $F(x)$ is a CDF for some random variable X if and only if it satisfies the following properties

- $\lim_{x \to -\infty} F(x) = 0$
- $\lim_{x \to \infty} F(x) = 1$
- $\lim_{h \to 0^+} F(x + h) = F(x)$ (right continuous)
- $a < b$ also implies $F(a) \leq F(b)$

Probability Density Function

Probability Density Function

Two definitions

Probability Density Function

Expected Value

Example

Let c be a constant and

$$f(x) = \begin{cases} 0 & \text{for } x \leq 0 \\ c(x^2+1) & \text{for } 0 < x < 1 \\ 0 & \text{for } x \geq 1 \end{cases}$$

1. Find c.
2. Find $\mathbb{P}(.25 < X \leq .50)$.
3. Find $\mathbb{P}(.25 < X < .50)$.
4. Find F.
5. Find $\mathbb{E}(X)$ and σ^2.

Example

Example

Example

Next Time

- Midterm Review