Statistics 270 - Lecture 13

- Last day/Today: Continuous Random Variables (4.1 and 4.2)
- Next Day: midterm!!!!
- Assignment 5: Chapter 4: 4, 8, 18, 20, 24

Using the CDF to Compute Probabilities

- Can use cdf to compute the probabilities of intervals…integration
- Can also use cdf: $P(a \le X \le b) =$
- $P(X > a) =$

Example

- The cdf for a particular random variable, X, is

$$F(x) = \begin{cases} 0 \quad \text{for} \quad x < -2 \\ \frac{1}{2} + \frac{3}{32}\left(4x - \frac{x^3}{3}\right) \quad \text{for } -2 \le x < 2 \\ 1 \quad \text{for } 2 \le x \end{cases}$$

- Compute P(-1< X< 1)

- Compute P(X> -1)

Using the CDF to Compute Percentiles

- Can use cdf to compute the percentiles:

Example

- The cdf for a particular random variable, X, is

$$F(x) = \begin{cases} 0 \quad \text{for} \quad x < -2 \\ \frac{1}{2} + \frac{3}{32}\left(4x - \frac{x^3}{3}\right) \quad \text{for } -2 \le x < 2 \\ 1 \quad \text{for } 2 \le x \end{cases}$$

- Find the median of X

Expected Value of a Continuous Random Variable

- The expected value (mean value):

- Expected Value of a function of a random variable:

Variance of a Continuous Random Variable

- Variance:

- Alternate formula:

Example (Chapter 4 - # 15):

- Let X be a rv with pdf:

$$f(x) = \begin{cases} 90x^9(1-x) & \text{for} \quad 0 < x < 1 \\ 0 & \text{Otherwise} \end{cases}$$

- Find the mean and variance of X

Obtaining the PDF from the CDF

- If X is a continuous random variable with cdf F(x) and pdf f(x), then at every x at which the derivative of F(x) exists…

Example

- The cdf for a particular random variable, X, is

$$F(x) = \begin{cases} 0 \quad \text{for} \quad x < -2 \\ \frac{1}{2} + \frac{3}{32}\left(4x - \frac{x^3}{3}\right) \quad \text{for } -2 \le x < 2 \\ 1 \quad \text{for } 2 \le x \end{cases}$$

- Find the mean of X

Example

- The weekly demand for propane gas (in 1000's of gallons) from a particular facility is an rv X with pdf

$$f(x) = \begin{cases} 2(1 - \frac{1}{x^2}) & \text{for } 1 \le x \le 2 \\ 0 & \text{otherwise} \end{cases}$$

- Obtain the cdf

Example

- Obtain an expression for the $100p^{th}$ percentile

- If 1500 gallons are in stock at the beginning of the week and no new supply is due during the week. What is the expected amount left at the end of the week?