

Lecture 19 Summary

Chapter 6. The Normal Distribution

1) Continuous Random Variable

- A random variable X is continuous if it represents some measurement on a continuous scale.
- Let X be a continuous random variable. Then the probability density function (pdf) $f(x)$ of X has the following properties.
 - (a) $f(x) \geq 0$ for all x .
 - (b) The total area under the curve is 1.
 - (c) $P(a \leq X \leq b)$ is the area under the curve between a and b .
- $P(X = c) = 0$ for any number c .
- If X is a continuous random variable, then for any two numbers a and b with $a < b$,

$$P(a \leq X \leq b) = P(a \leq X < b) = P(a < X \leq b) = P(a < X < b)$$

$$P(a < X < b) = P(X < b) - P(X < a)$$

Example 1 Examine if the following are legitimate pdf's.

- (a) $f(x) = x - 1$, $0 < x < 2 \implies$ No, since $f(x) < 0$ for $0 < x < 1$.
- (b) $f(x) = -(x/2) + 1$, $0 < x < 2 \implies$ Yes.
- (c) $f(x) = 1$, $0 < x < 2 \implies$ No, since the total area under the function is bigger than 1.

- The 100 p th percentile: x such that $P(X \leq x) = p$
 Lower (first) quartile = 25th percentile
 Second quartile (median) = 50th percentile
 Upper (third) quartile = 75th percentile