Topics Covered in Lecture 13

27-August, 2002

- Home work # 1 solutions are discussed.
- Disk seek problem. If the current distance of the disk head is X and if the destination distance is Y then,

$$f_X(x) = \begin{cases} \frac{1}{b-a}, & a < x < b \\ 0, & \text{otherwise} \end{cases}$$

$$f_Y(y) = \begin{cases} \frac{1}{b-a}, & a < x < b \\ 0, & \text{otherwise} \end{cases}$$

$$\phi(X, Y) = \int \int |x - y| f_{X,Y}(x, y)\, dxdy$$

$$E[|X - Y|] = \frac{b-a}{3}$$

- **The Linearity Property of Expectation**

  E[X + Y] = E[X] + E[Y]

- E[XY] = E[X]E[Y], if X and Y are independent random variables.
- if Var[X + Y] = Var[X] + Var[Y] if X and Y are independent.
- Var[X + Y] = Var[X] + Var[Y] + 2Cov(X, Y), if X and Y are not independent.

  Cov(X, Y) = E[XY] - E[X]E[Y]

- $$Var[\bar{X}] = Var\left[\frac{1}{n}\sum_{i=1}^{n} X_i\right] = \frac{1}{n^2}Var\left[\sum_{i=1}^{n} X_i\right] = \frac{\sigma^2}{n}$$

- $$\rho(X, Y) = \frac{Cov(X, Y)}{\sqrt{Var[X]Var[Y]}} = \frac{Cov(X, Y)}{\sigma_X \sigma_Y}$$