

**CmpE 343**  
**Fall 2008**  
**Problem Session#3**

**Question1:** Two real-valued random variables,  $X$  and  $Y$ , have joint probability density function

$$f(x, y) = \frac{1}{2\pi\sqrt{(1-r^2)}} \exp\left(-\frac{x^2 - 2rxy + y^2}{2(1-r^2)}\right),$$

where  $-1 < r < 1$ .

- (a) Prove that each of  $X$  and  $Y$  is normally distributed with mean 0 and variance 1.
- (b) Show that  $Cov[X, Y] = r$ .

**Question2:** If  $X_1, X_2, X_3, X_4, X_5$  are independent and identically distributed exponential random variables with the parameter  $\beta$ .

- (a) Find  $\Pr(\min\{X_1, X_2, X_3, X_4, X_5\} \leq a)$ .
- (b) Find  $\Pr(\max\{X_1, X_2, X_3, X_4, X_5\} \leq a)$ .

**Question3:** Let  $X_1, X_2, X_3$  be independent and exponential random variables with respective parameters  $\beta_1, \beta_2, \beta_3$ . Find  $\Pr(X_1 < X_2 < X_3)$ .