

Econometrics I
 Problem Set 1
 Sep. 27, 2002
 Due: Oct. 4, 2002

1. The joint density function of two continuous random variables X and Y is as follows

$$f(X, Y) = \begin{cases} \frac{1}{3}(4 - X - Y), & 0 \leq X \leq 1, \quad 0 \leq Y \leq 1 \\ 0, & \text{otherwise} \end{cases}$$

- (a) Find the marginal density functions, $f(X)$ and $f(Y)$.
 - (b) Find the conditional density functions, $f(X|Y)$ and $f(Y|X)$.
 - (c) Find $E(X)$ and $E(Y)$.
 - (d) Find $E(X|Y = 0.4)$.
2. Suppose that the joint probability distribution of X and Y is given by the following table:

(x,y)	2	4	6
1	0.2	0	0.2
2	0	0.2	0
3	0.2	0	0.2

- (a) Are X and Y independent? Explain.
 - (b) Find the marginal distributions of X and Y .
 - (c) Find the conditional distribution of Y given $X = 1$ and hence $E(Y|X = 1)$ and $\text{Var}(Y|X = 1)$.
3. Are the following models linear regression model? Why or why not?

- (a) $Y_i = e^{\beta_1 + \beta_2 X_i + u_i}$
- (b) $Y_i = \frac{1}{1 + e^{\beta_1 + \beta_2 X_i + u_i}}$
- (c) $\ln Y_i = \beta_1 + \beta_2 \frac{1}{X_i} + u_i$
- (d) $Y_i = \beta_1 + (0.75 - \beta_1)e^{-\beta_2(X_i - 2)} + u_i$
- (e) $Y_i = \beta_1 + \beta_2^3 X_i + u_i$