

**ECONOMICS 6331 – Probability and Statistics, Fall 2007**

Homework 6. Wednesday October 17. Due Monday October 22.

1. Consider two random variables  $X$  and  $Y$ . Assume they both are discrete and that  $X$  can take the values 1,2, and 3 while  $Y$  takes the values 0 and 2. The probabilities for  $(X,Y)$  are shown in the following table:

	X=1	X=2	X=3
Y=0	3/24	3/24	6/24
Y=2	3/24	5/24	4/24

- i) Find the marginal probabilities of  $X$  and  $Y$ . Mark clearly which are the marginal probabilities of  $X$  and which are the marginal probabilities of  $Y$ . Explain what the marginal probabilities measure.
- ii) Find the means and the variances of  $X$  and  $Y$ .
- iii) Are the events  $X = 1$  and  $Y = 2$  independent events?
- iv) Are the random variables  $X$  and  $Y$  independent?
- v) Find the probability  $P(\{X > 1\} \cap \{Y \leq 1\})$
- vi) Find the conditional distribution of  $X$  given  $Y = 2$ .
- vii) Find the random variable  $E(X|Y)$ .
- viii) Take the mean of the random variable that you derived in vii) and verify that it equals  $E(X)$ .
- ix) Find  $Var(X|Y = 2)$ .

2. Ramanathan, Exercise 5.1, page 117. (The demonstrates that a random variable  $Y$  say can be a (non-linear) function of another random variable  $X$  without the correlation being unity.)

3. Ramanathan, Practise problem 5.2, page 84.