

MATH 371  
Review problems

2. In a large calculus class of 200 students, 40 earn an A on a test, 60 earn a B, and the remaining students earn a C, D, or F. Suppose a random sample of size 25 is taken.
- (a) Find the probability that five students in the sample earned an A on the exam.
  - (b) Find the marginal probability function for the variable  
     $A$ : number of students who earned an A on the exam.
  - (c) Write down a formula that computes the probability of the event  
     $E$ : Between 2 and 5 students in the sample earn a B on the exam,  
        given that 10 students in the sample earned an A.
  - (d) Give the probability function for the jointly distributed random variables  $(A, B)$ .  
    Are  $A$  and  $B$  independent?
3. Consider the jointly distributed random variables  $(X, Y)$  with joint density function

$$f(x, y) = \begin{cases} ce^{-y}, & \text{for } 0 \leq x \leq e^2 - 1, 0 \leq y \leq \ln(x + 1) \\ 0, & \text{otherwise.} \end{cases}$$

- (a) Draw the *support* of the joint density function  $f(x, y)$ ; that is, the region  $S$  where  $f(x, y) > 0$ . Then find the value of  $c$  so that  $f(x, y)$  is a valid density function on  $S$ .
- (b) Set up an integral to find the marginal density  $f_Y(y)$  and include the domain of this function.
- (c) Verify that your marginal density  $f_Y(y)$  is correct by integrating it on the support of  $Y$ .
- (d) Find the value of the conditional probability  $P(X \geq 4 \mid Y = \ln(3))$ .    *Answer:*  $\frac{e^2 - 5}{e^2 - 3} \approx .54$ .