

MATH 371
Review problems

2. In a large calculus class of 200 students, 40 earn an A on a text, 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:* $\frac{e^2 - 5}{e^2 - 3} \approx .54$.