Math 262 - 13 November 2019 TWO DISCRETE RANDOM VARIABLES For two discrete rus X and Y: JOINT PROBABILITY MASS FUNCTION: p(x, y) = P(X=x, Y=y)MARGINAL PROBABIL ITY MASS FUNCTIONS:  $p_X(x) = \sum p(x, \gamma)$  and  $p_Y(\gamma) = \sum p(x, \gamma)$ give probabilities for X and Y individually

A cafeteria has three meal options: pizza, burgers, and salad bar. Three students each choose one option independently at random (equally likely to choose any option). Let *X* be the number (of the 3) who choose pizza, and let *Y* be the number who choose the salad bar.

(a) What is the joint pmf of *X* and *Y*? 1 chooses pizza, 2 choose burger P(x,y) = 0 = 1p(1,0) = p(student 1 pizza)  $P_{Y}(\gamma)$ 3  $0 \quad \frac{1}{27} \quad \frac{1}{9} \quad \frac{1}{9} \quad \frac{1}{27}$ 8 27 4  $\begin{vmatrix} \frac{1}{9} & \frac{2}{9} & \frac{1}{9} \\ \end{vmatrix} 0$ 1 29 2 0 0  $\frac{1}{27}$ 127 3 4 8  $P_{\times}(x)$ (b) What are the marginal pmfs of *X* and *Y*? (c) Are *X* and *Y* independent? Why or why not? Discrete rus X and Y are INDEPENDENT if for every pair of values x and y,  $p(x,y) = p_x(x) p_y(y)$ .



(a) What is the joint density function of X and Y?  

$$f(x,y) = 1 \quad on \quad [0,1]^2 \qquad \text{bivariate uniform distribution}$$

$$0.2 \quad 1 \quad y = 0.2 \quad (0.4) \quad (1) = 0.08$$

(b) Find 
$$P(X \le 0.2, 0.1 \le Y \le 0.5)$$
.  
(c) Find  $P(X \le Y)$ .  
(c)