



4) The joint density function for a pair for random variables  $X$  and  $Y$  is:

$$f(x, y) = \begin{cases} Cx(1+y) & \text{if } 0 \leq x \leq 1, 0 \leq y \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

- a) Find the value of the constant  $C$ .
- b) Find  $P(X \leq 1, Y \leq 1)$ .
- c) Find  $P(X + Y \leq 1)$ .

5) A lamp has two bulbs of a specific type with an average lifetime of 1000 hours. Assuming that we can model the probability of failure of these bulbs by an exponential density function with mean  $\mu = 1000$ , find the probability that both of the lamp's bulbs fail within 1000 hours.