theoretical joint distributions

exercise 4

Let X and Y be two jointly continuous random variables with the following joint pdf

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

(a) Find a sketch the joint range of X and Y (i.e. $\Omega_{X,Y}$).

(b) Find the constant c that makes $f(x, y)$ a valid joint pdf.

(c) Find $P(0 \leq X \leq 1/2, 0 \leq Y \leq 1/2)$.

marginal distributions