

125. Solution: E

The support of  $(X, Y)$  is  $0 < y < x < 1$ .

$f_{X,Y}(x, y) = f(y|x)f_X(x) = 2$  on that support. It is clear geometrically

(a flat joint density over the triangular region  $0 < y < x < 1$ ) that when  $Y = y$

we have  $X \sim U(y, 1)$  so that  $f(x|y) = \frac{1}{1-y}$  for  $y < x < 1$ .

By computation:

$$f_Y(y) = \int_y^1 2dx = 2 - 2y \Rightarrow f(x|y) = \frac{f_{X,Y}(x, y)}{f_Y(y)} = \frac{2}{2 - 2y} = \frac{1}{1 - y} \text{ for } y < x < 1$$