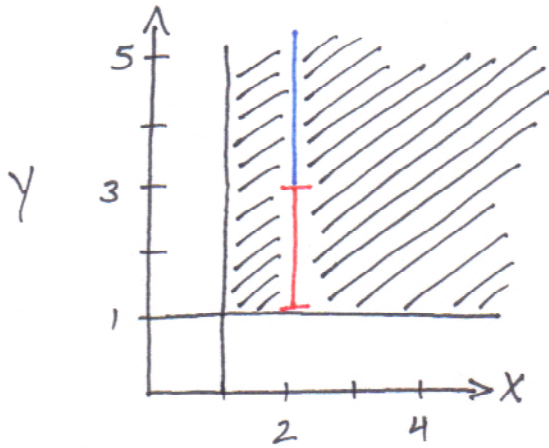


Problem 111



$$P(1 < Y < 3 | X=2)$$

$$f(x, y) = \frac{2}{x^2 \cdot (x-1)} \cdot y^{-\frac{2x-1}{x-1}}$$

$$f_{X,Y}(2, y) = \frac{2}{2^2 \cdot (2-1)} \cdot y^{-\frac{2(2)-1}{2-1}} = \frac{1}{2} \cdot y^{-3}$$

$$\begin{aligned} f_X(z) &= \int_1^{\infty} f_{X,Y}(z, y) \cdot dy \\ &= \int_1^{\infty} \frac{1}{2} \cdot y^{-3} \cdot dy = \frac{1}{2} \left(-\frac{1}{2}\right) y^{-2} \Big|_1^{\infty} = \frac{1}{4} \end{aligned}$$

$$f(y|x=2) = \frac{\frac{1}{2} \cdot y^{-3}}{\frac{1}{4}} = 2 \cdot y^{-3}$$

$$f(y|x) = \frac{f_{X,Y}(x, y)}{f_X(x)}$$

$$\begin{aligned} P(1 < Y < 3 | X=2) &= \int_1^3 f(y|x=2) \cdot dy \\ &= \int_1^3 2 \cdot y^{-3} \cdot dy \\ &= -\frac{2}{2} \cdot y^{-2} \Big|_1^3 \\ &= 1 - \frac{1}{9} = \frac{8}{9} \end{aligned}$$

$\square$