

111. Solution: E

$$\Pr[1 < Y < 3 | X = 2] = \int_1^3 \frac{f(2, y)}{f_x(2)} dy$$

$$f(2, y) = \frac{2}{4(2-1)} y^{-(4-1)/2-1} = \frac{1}{2} y^{-3}$$

$$f_x(2) = \int_1^{\infty} \frac{1}{2} y^{-3} dy = -\frac{1}{4} y^{-2} \Big|_1^{\infty} = \frac{1}{4}$$

$$\text{Finally, } \Pr[1 < Y < 3 | X = 2] = \frac{\int_1^3 \frac{1}{2} y^{-3} dy}{\frac{1}{4}} = -y^{-2} \Big|_1^3 = 1 - \frac{1}{9} = \frac{8}{9}$$