

Quiz 7

ECEn 370

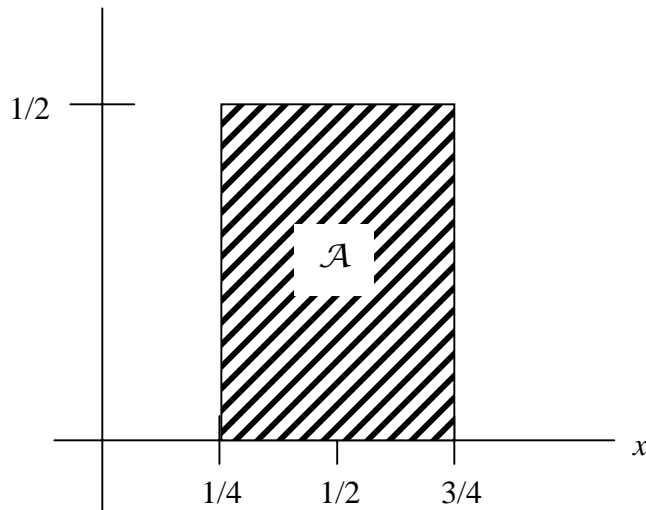
Name: _____

1. Let X and Y be jointly distributed as

$$f_{XY}(x, y) = (4x + 2y)u(x)u(1/2 - x)u(y)u(1 - y) = \begin{cases} 4x + 2y & 0 \leq x \leq 0.5, 0 \leq y \leq 1 \\ 0 & \text{otherwise} \end{cases},$$

where $u(x)$ is the unit step function.

Find $P[(X, Y) \in \mathcal{A}]$ for the region as seen in the figure below



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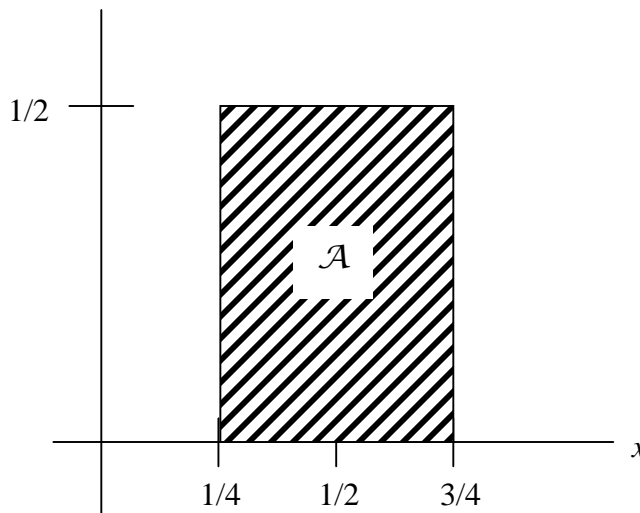
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$$\begin{aligned} P[(X, Y) \in \mathcal{A}] &= \int_{y=0}^{y=1/2} \int_{x=1/4}^{x=1/2} (4x + 2y) dx dy = \int_{y=0}^{y=1/2} (2x^2 + 2xy) \Big|_{x=1/4}^{x=1/2} dy \\ &= \int_{y=0}^{y=1/2} \left(\frac{1}{2} + y - \frac{1}{8} - \frac{y}{2} \right) dy = \int_{y=0}^{y=1/2} \left(\frac{y}{2} + \frac{3}{8} \right) dy = \frac{y^2}{4} + \frac{3}{8}y \Big|_0^{1/2} = \frac{1}{4}. \end{aligned}$$