

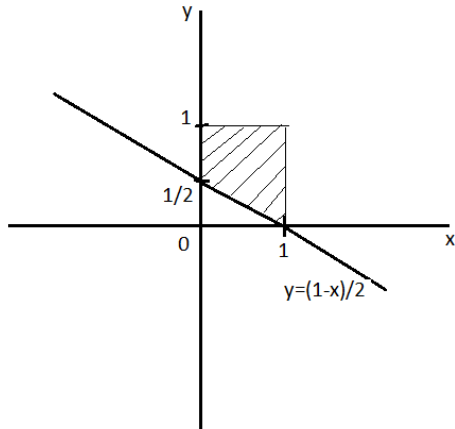
Answer to Question #74984, Math / Statistics and Probability

Let (X, Y) have the following joint p.d.f.

$$f(x, y) = \begin{cases} 6xy & \text{for } 0 < x < 1, 0 < y < 1 \\ 0, & \text{otherwise} \end{cases}$$

Find $P(2Y + X > 1)$.

Solution.



To find the probability we integrate p.d.f. over the shaded region:

$$\begin{aligned} P(2Y + X > 1) &= \int_0^1 dx \int_{\frac{1-x}{2}}^1 6xy dy = 6 \int_0^1 \left(\frac{xy^2}{2} \Big|_{\frac{1-x}{2}}^1 \right) dx = 3 \int_0^1 \left(x - \frac{x(1-x)^2}{4} \right) dx = \\ &= \int_0^1 \left(x - \frac{x^3 - 2x^2 + x}{4} \right) dx = \left(\frac{3x^2}{8} + \frac{x^3}{6} - \frac{x^4}{16} \right) \Big|_0^1 = \frac{3}{8} + \frac{1}{6} - \frac{1}{16} = \frac{18 + 8 - 3}{48} = \frac{23}{48} \end{aligned}$$

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