

1. Suppose that  $X$  and  $Y$  have joint probability density function  $f_{X,Y}(x,y) = 15e^{-5x-3y}$  for  $x > 0$  and  $y > 0$ , and  $f_{X,Y}(x,y) = 0$  otherwise.

1a. Find  $\text{Var}(X)$ .

1b. Find  $\text{Var}(Y)$ .

2. Suppose that  $X$  and  $Y$  have joint density  $f_{X,Y}(x,y) = 24e^{-5x-3y}$  for  $y > x > 0$ , and  $f_{X,Y}(x,y) = 0$  otherwise. Find  $\text{Var}(X)$ .

3. Consider a pair of random variables  $X, Y$  with constant joint density on the triangle with vertices at  $(0, 0)$ ,  $(8, 0)$ , and  $(0, 4)$ .

3a. Find  $\text{Var}(X)$ .

3b. Find  $\text{Var}(Y)$ .

4. Suppose that  $X$  and  $Y$  have joint probability density function

$$f_{X,Y}(x,y) = \begin{cases} \frac{1}{12}(4 - xy) & \text{if } 0 < x < 2 \text{ and } 0 < y < 2 \\ 0 & \text{otherwise} \end{cases}$$

Find  $\text{Var}(X)$ .

(Just as an interesting aside, notice that, by symmetry, in this case,  $\text{Var}(Y) = \text{Var}(X)$ .)