Joint Continuous Distributions: Example

Suppose X , Y are continuous random variables with joint density

$$f(x, y) = k\, e^{-\lambda(x+y)} \quad \text{for } 0 \le x \le y \ , \ \lambda > 0 \text{ and is equal to 0 otherwise.}$$

a) How can you determine the constant k?

b) Find the marginal probability density functions of X and Y . Write each density in terms of an integral with the appropriate limits of integration; do not evaluate.

c) Find the conditional densities of X and Y .

d) Find $P(X + Y \le 4)$. Write your answer as an integral; do not evaluate.