Multivariate distributions

Calculating conditional PDF

Let $f(x,y) = 15x^2y$ for $0 \le x \le y \le 1$. Find f(x|y).¹

Properties of a joint PDF

Continuous random variables X and Y have the following joint probability density function (PDF):²

$$f_{XY}(x,y) = \begin{cases} kx^2y^3 & \text{where } 0 < x, y < 6\\ 0 & \text{otherwise} \end{cases}$$

Note: 0 < x, y < 6 means that both x and y are between 0 and 6; it does not mean that x is greater than 0 and y is less than 6.

a. Find k.

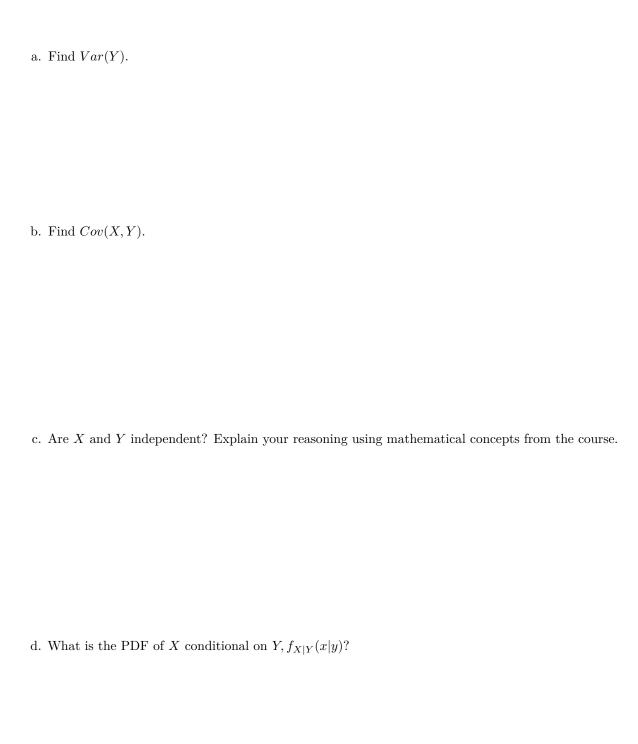
b. Find the marginal PDF of X, $f_X(x)$.

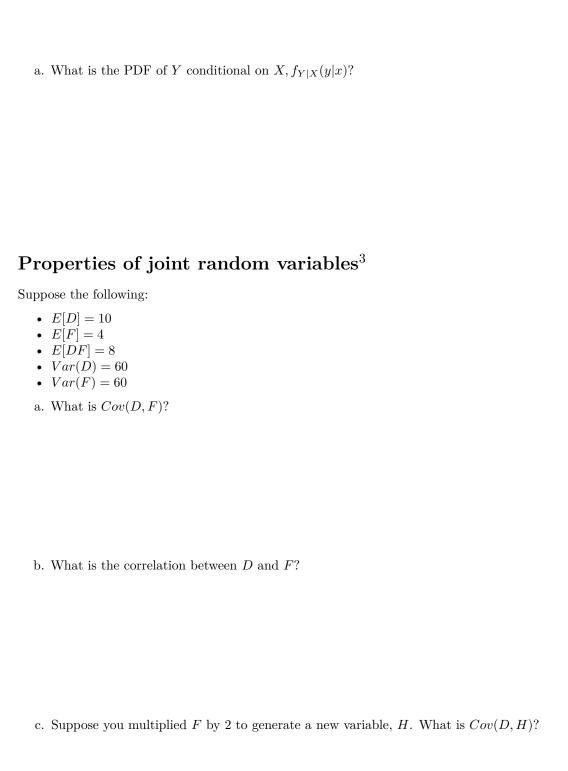
¹Grimmer HW12.4

 $^{^2{}m Grimmer~HW}12.1$

c.	Find	the marginal PDF of Y , $f_Y(y)$.
1.	Find	$\mathrm{E}[X].$
e.	Find	$\mathrm{E}[Y].$

f. Find Var(X).





 $^{^3{}m Grimmer~HW12.3}$

d. What is Cor(D, H)? How does this compare to your answer to Part (b) of this question?

e. Suppose instead that Var(D) = 30. How would this change Cor(D, F)?

Continuous Bayes' theorem

Previously, we used Bayes' theorem to link the conditional probability of discrete events A given B to the probability of B given A. There is an analogous Bayes' theorem that relates the conditional densities of random variables X and θ (below) Prove the continuous Bayes' theorem.⁴

$$f(\theta \mid X) = \frac{f(X \mid \theta)f(\theta)}{\int f(X \mid \theta)f(\theta)d\theta}$$

Submission of practice questions

Submit practice questions for the final exam here: https://forms.gle/CPo9FMQgQRPePDfN7 Note that we need at least 10 people to submit before there's enough to circulate!

⁴Grimmer HW12.5