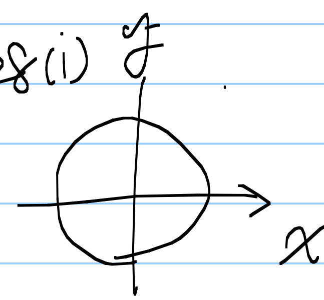
* From joint pdf to marginal pdf.

Knowing $f_{XY}(x,y)$ how to construct $f_X(x)$ (or $f_Y(y)$)

Ans:

Ex: HW11 Q3 Problem 5.28(i)



$$f_{XY}(x,y) = \begin{cases} \frac{1}{\pi} & \text{if} \\ 0 & \text{otherwise.} \end{cases}$$

Find the marginal $f_Y(y)$.

Ans:

Joint pdf $\longrightarrow$ marginal pdf ✓

How about marginal + conditional pdf

$\longrightarrow$ joint pdf ?

Ex: X is uniformly distributed on the interval $(0,2)$, and given $X=x$. Y is exponential with $\lambda = x$

Q: find the joint pdf of X, Y.

Ans:

* Independence: the marginals $\equiv$ conditional

$$\Rightarrow \quad f_{XY}(x,y) = f_X(x) \cdot f_Y(y)$$

Ex: X is uniform on $(0,2)$
Y is exponential with $\lambda = 2$
X, Y are indep. Q: $f_{XY}(x,y) = ?$

Ans:

Summary

Note Title 3/21/2011

* Continuous 2-dim R.V.s.

$S_{XY} = \{$ all real vectors $\}$

W.A: Joint pdf $f_{XY}(x, y)$

the prob is the volume above the area of interest.

* Joint $\xrightarrow{\text{integration}}$ marginal

* Marginal · conditional $\longrightarrow$ joint

$$P(X=k) \cdot P(Y=h \mid X=k) = P(X=k, Y=h)$$

$$f_X(x) \cdot f_{Y|X}(y|x) = f_{XY}(x, y)$$

* Independence

$$\underbrace{f_{Y|X}(y|x)}_{\text{conditional}} = \underbrace{f_Y(y)}_{\text{marginal}}$$

$$\Rightarrow \quad f_{XY}(x, y) = f_X(x) \cdot f_Y(y)$$

* Expectation for 2-dim conti R.V.

$E(g(X,Y))$ | say $E(X^2\sqrt{Y}+3Y)$

HW11 Q10 Prob 5.58

X is standard Gsn

Y is uniform on $[0,3]$

X & Y are indep

Q: Find $f_{XY}(x,y)$

Q: $E(X^2e^Y)=?$

Ans:

Q: $E(X^2 e^Y)$

* Joint cdf: a unifying way to describe 2-dim discrete/conti R.Vs.

Joint cdf

$F_{XY}(x, y)$ is a function of two para. x & y.

Ex: X and Y have a joint pmf

X \ Y	1	2
0	$\frac{1}{4}$	$\frac{1}{3}$
1	$\frac{1}{3}$	$\frac{1}{12}$

Find the joint cdf $F_{XY}(x, y)$

Ans: