Assignment 1

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1

Hence

$$P_{V,\theta}(v,\theta) = |J| P_{X1,X2}(x1,x2) dv d\theta$$

let

$$x1 = vcos\theta$$

$$x2 = vsin\theta$$

$$J = \begin{vmatrix} cos\theta & -vsin\theta \\ sin\theta & vcos\theta \end{vmatrix} = v$$

Let joint distribution of X1 and X2 is

$$P_{X1,X2}(x1,x2) = x1 + x2$$

and joint distribution of V and θ is

$$P_{V,\theta}(v,\theta) = v + \theta$$

then

$$P_{V,\theta}(v,\theta) = v(v+\theta)$$

$$= v^2 + v\theta$$

2 Problem 6.2.4

Find $P_V(v)$
Solution: Say θ varies from 0 to 2π , then
$P_V(v) = \int_0^{2\pi} P_{V,\theta}(v,\theta)\, d\theta$
$= \int_0^{2\pi} (v^2 + v\theta)\, d\theta$
$= v^2[\theta]_0^{2\pi} + [\theta^2/2]_0^{2\pi}$
$= 2\pi v^2 + 2\pi^2 v$
$= 2\pi v(v+\pi)$

3 Problem 6.2.5

Find $P_\theta(\theta)$
Solution : Say v varies from 0 to constant R, then
$P_\theta(\theta) = \int_0^R P_{V,\theta}(v,\theta)\, dv$
$= \int_0^R (v^2 + v\theta) dv$
$= [v^3/3]_0^R + [v^2/2]_0^R \theta$
$= R^3/3 + (R^2/2)\theta$

4 Problem 6.2.6

Since

$$P_{v,\theta}(v,\theta)! = P_V(v) * P_\theta(\theta)$$

hence V and are not independent.