* Marginal Probability density function page.37

In two RV’s

* Example

1. Is it a CDF ?



1. Find
2. Is independent? No since

* Example 2



Is this PDF independent? Yes…. Prove it.

In stochastic control in this semester, most of RV(or Random process is a Gaussian)

Theorem 2.30 , . Find mean and covariance of

* Characteristic function is difficult to remember. In the text book, using the characteristic method. In this case we may apply basic theory.

Sol: Let’s apply the basic definition.

Hence

* Theorem 2.30 is important. But **the assumption in the theorem is insufficient** as

are independent.

* In general, independency implies the uncorrelated, not vice versa
* However, in Gaussian Does satisfy the opposite direction.
* The covariance of a uncorrelated (so independent) Gaussian is a diagonal matrix,
* Linear matrix theory: similar transform

We know for any semi-positive symmetric matrix , there is a similar transform matrix such that

Hence the covariance for any gaussian Random vectors (correlated), there exits a such that

* Any Gaussian Random vectors, we can find a transformed Random Vectors which is uncorrelated (independent).
* Independency is important to calculate the probability. You know the Gaussian probability table, but it is a scalar. So it you want to calculate the joint probability which may be correlated, first find a similar transform matrix to generate a diagonal covariance matrix. Then you may calculate the joint probability as a separate probability.
* Home assignment (due next Tuesday)

1. Gaussian linear transform
2. Using Matlab, generate two RV which is independent
3. Check their independency
4. Find the probability of and
5. Find the joint prob.
6. Let’s define another RVs.
7. Calculate , covariance matrix of
8. is independent? Verify
9. Find the joint probability
10. Exercise 6