**Assignment 2**

Name: HUANG Junxin Student No.: 22401601

**Question 1**

**1.1**

In the polar coordinate system, the inequality of the Domain of values:

Will became:

Where:

Then, the Domain can be written as:

Thus, the value c can be deduced from:

Obviously,

**1.2.1**

As we know the Domain of values is:

We can have:

The density function w.r.t. the random variable X would be:

When :

**1.2.2**

To calculate the Expectation of a random variable X (denoted as E[X]), we have:

When :

Let:

We have:

The function is an odd function, because:

Thus,

**1.3.1**

According to the result of Question 1.2.2,

Obviously, we have:

Then we have:

Then, when :

Obviously, and are odd functions, thus:

Thus,

**1.3.2**

To proof the two random continuous variables are independent, we can try to proof:

If has two margin distribution functions and , for any random continuous variables in {x, y}, they are independent if and only if we have . So that the original question can then be proved.

According to Question 1.2.1, we have:

Similarly, we can also have:

Then we have (when ):

Because:

Thus, the two random continuous variables are not independent.

**Question 2**

**2.1**

If you do not know exactly the nature of a thing, Bayes' theorem can be used to determine the probability of its essential properties with the help of the number of events that occur in relation to the particular nature of the thing.

Bayes' theorem mathematically describes the relationship between the probability of event A given the conditions under which event B occurs and the probability of event B given the conditions under which event A occurs.

According to the multiplication rule, we have:

Clearly, it can be deduced that:

**2.2**

Let one green ball be drawn from the bag as event A; one ball be drawn from Bag-II as event B.

Then, we can easily have:

**2.3.1**

Let the person uses his car as the event A1, the person walks as the event A2, the person takes the bus as the event A3; the person be late as the event B.

Then, we can easily have:

**2.3.2**