**Tutorial set #4**

**Question 1:**

The following data represent the monthly sales (in thousand riyals) for a particular electrical appliance (read the data across from left to right).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 56 | 44 | 42 | 52 | 48 | 66 | 43 | 53 |
| 56 | 38 | 56 | 51 | 54 | 41 | 58 | 44 |
| 60 | 39 | 57 | 34 | 59 | 32 | 52 | 49 |
|  |  |  |  |  | 43 | 52 | 41 |

1. Plot the data, and comment on the stationarity of the data.
2. Based on the figure, can you say anything about the approximate value of the autocorrelation coefficient $ρ\_{1}$?
3. Plot $y\_{t}$ against $y\_{t-1}$, try to guess the value of $ρ\_{1}$.
4. Find and plot the sample autocorrelation function $r\_{k}$ for $k=0,1,2,3,4,5$. Comment on the shape of this function.
5. Find and plot the sample partial autocorrelation function $r\_{kk}$ for $k=0,1,2,3,4,5$. Comment on the shape of this function.

**Question 2:**

In the following cases, comment on the stationarity of the time series, and in case of non-stationarity, briefly explain how you will deal with the problem:

1. The following series represent average monthly temperatures for a period of 10 years:



1. The following series represent monthly numbers (in thousands) of international travelers for a period of 10 years:

 

1. A time series representing the monthly demand of a particular item:



1. A time series representing the weekly sales of a large company:



**Question 3:**

In the general linear process, $Y\_{t}=μ\_{Y}+\sum\_{j=0}^{\infty }ψ\_{j}a\_{t-j} $, we used the following $ψ\_{j}$ weights:

1. $ψ\_{j}=ϕ^{j}$ for j=1,2,…, where $\left|ϕ\right|<1$. What is the form of the resulting process, and derive its autocorrelation function.
2. $ψ\_{1}=-θ\_{1}$, $ψ\_{j}=0,$ for $j=2,3,…$, where, $\left|θ\right|<1$. What is the form of the resulting process, and derive its autocorrelation function.