**Tutorial set #5**

**Question 1:**

Suppose that the process $\left\{y\_{t}\right\}$ follows an AR(1) model, with $\left|ϕ\_{1}\right|<1$, find the autocovariance function for the process $W\_{t}=∇y\_{t}=(y\_{t}-y\_{t-1})$ in terms of $ϕ\_{1}$ and $σ\_{ε}^{2}$, (where $σ\_{ε}^{2}$ is the white noise variance).

**Question 2:**

Let the process $\left\{y\_{t}\right\}$ follows an AR(2) model, with the following special form: $y\_{t}=ϕ\_{2} y\_{t-2}+ε\_{t}$, use the general method to find the values of $ϕ\_{2}$ that make the process stationary.

**Question 3:**

Let the process $\left\{y\_{t}\right\}$ follows an AR(2) model, with the following parameter values: $ϕ\_{1}=0.5, ϕ\_{2}=-0.5$:

1. is the process $\left\{y\_{t}\right\}$ stationary?
2. find the $ψ\_{j}$ weights in the general linear process.

**Question 4:**

Let the process $\left\{y\_{t}\right\}$ follows an AR(2) model, for the following cases find the roots of the characteristic equation, and check if the process is stationary:

1. with parameters: $ϕ\_{1}=0.6, ϕ\_{2}=-0.8$
2. with parameters: $ϕ\_{1}=2.4, ϕ\_{2}=-0.8$

**Question 5:**

Find the Yule-Walker equations for the following models:

1. $y\_{t}-0.8y\_{t-1}=ε\_{t}$
2. $y\_{t}-0.9y\_{t-1}+0.4y\_{t-2}=ε\_{t}$

and solve these equations to get values for $ρ\_{1}$ and $ρ\_{2}$.

**Question 6:**

For the attached two sets of data (data1) and (data2), do the following:

1. Plot the series, and check its stationarity in mean and variance.
2. plot the ACF and PACF , suggest a preliminary model for the data.
3. Fit the suggested models, and get acquainted with the MINITAB output.