1. Consider the stationary process 
\[ Z_t = \mu + \phi Z_{t-1} + \alpha_t, \alpha_t \sim WN(0, \sigma_a^2) \], and \(|\phi| < 1\). Find \( E(Z_t) \) and \( \text{Cov}(Z_t, Z_{t+k}) \) for k=0,1,2,.....

2. Consider the process 
\[ Z_t = 0.5Z_{t-1} - 0.06Z_{t-2} + a_t - 0.8a_{t-1} + 0.16a_{t-2}. \]
Find the values of \( \psi_j, j = 0, 1, 2, 3... \) if the process is written in the form of general linear model
\[ Z_t = \sum_{j=0}^{\infty} \psi_j a_{t-j} \]

3. Consider the process
\[ Z_t = 0.6Z_{t-1} + a_t - 0.2a_{t-1} \]
(a) Find the values of \( \psi_1, \psi_2 \) and \( \psi_3 \) if the process is written as
\[ Z_t = a_t + \sum_{k=1}^{\infty} \psi_k a_{t-k} \]
(b) Find \( \text{Var}(\sum_{t=1}^{4} Z_t) \) given that \( \sigma_a^2 = 4 \)

4. Identifying each of the following models as a specific ARIMA model, determine whether it is stationary, or invertible, or both.
   i) \((1 - B)Z_t = (1 - 1.5B)a_t\)
   ii) \((1 - 1.1B)Z_t = (1 - 1.7B + 0.72B^2)a_t\)
   iii) \((1 - 0.6B)Z_t = (1 - 1.2B + 0.2B^2)a_t\)
   iv) \((1 - 0.5B - 0.5B^2)Z_t = (1 - 1.2B + 0.2B^2)a_t\)
   v) \(Z_t = 0.4Z_{t-1} + 0.45Z_{t-2} + a_t + a_{t-1} + 0.25a_{t-2}\)
   vi) \(Z_t = 1.25Z_{t-1} - 0.25Z_{t-2} + a_t\)

5. Rewrite the following process into MA form and find the coefficient \( \psi_s \) for \( s=1,2,.... \)
\[ Z_t + 0.6Z_{t-2} = a_t + 0.5a_{t-1} \]

6. Consider the process 
\[ Z_t = 0.5Z_{t-1} - 0.06Z_{t-2} + a_t. \]
Write the general form \( \rho_k \) for k=0,1,2,3,4....