1. Consider the ARIMA model \((1 - 1.4B + .49B^2)(1 - B)z_t = (1 - .5B)a_t\).

(a) Find the coefficients \(\psi_1, \ldots, \psi_6\) in the MA form of \(z_t\).

(b) Give a general expression of \(\psi_j\) for \(j > 1\).

(c) Express \(z_t\) in a truncated MA form with respect to the time origin \(t = 3\).

(d) Find the \(\pi\) weights in the infinite order AR form, \((1 - \sum_{j=1}^{\infty} \pi_j B^j)z_t = a_t\), and verify that \(\sum_{j=1}^{\infty} \pi_j = 1\).

(e) Find the variance and autocorrelation of \(w_t = z_t - z_{t-1}\).

2. Consider \(Z_t = z_t + b_t\), where \(z_t = z_{t-1} + a_t\) with \(a_t\) a white noise, \(\sigma_a^2 = 1\), and \(b_t\) is another white noise independent of \(a_t\), \(\sigma_b^2 = 2\). Show that \(Z_t\) is an IMA(0,1,1) process, and specify all its parameters.

3. Consider \(Z_t = z_t + b_t\), where \(z_t = \phi z_{t-1} + a_t\) is stationary with \(a_t\) a white noise, and \(b_t\) is another white noise independent of \(a_t\).

(a) Show that \(Z_t\) is an ARMA process and identify its orders.

(b) Express the parameters of \(Z_t\) in terms of \(\phi\), \(\sigma_a^2\), and \(\sigma_b^2\).