5.1 a) $Y_t = 1 \cdot Y_{t-1} - 0.25 Y_{t-2} + e_t - 0.1 e_{t-1}$

$\phi_1 = 1 \quad \phi_2 = -0.25 \quad \theta_1 = 0.1 \longrightarrow$ ARIMA(2,0,1)

$\phi_1 + \phi_2 = 0.75 < 1 \quad \phi_2 - \phi_1 = -1.25 < 1 \quad |\phi_2| = 0.25 < 1$

$\therefore$ STATIONARY AND INVERTIBLE

b) $Y_t = 2Y_{t-1} - 1 \cdot Y_{t-2} + e_t$

$\phi_1 = 2 \quad \phi_2 = -1 \longrightarrow \phi_1 + \phi_2 = 1 \nless 1 \rightarrow$ NOT AR(2)

$Y_t - Y_{t-1} = (Y_{t-1} - Y_{t-2}) + e_t$

↳ AR(1), coef = 1?!

$Y_t - 2Y_{t-1} + Y_{t-1} = e_t \rightarrow$ WN

$\therefore Y_t$ IS ARIMA(0,2,0)

c) $Y_t = 0.5 Y_{t-1} - 0.5 Y_{t-2} + e_t - 0.5 e_{t-1} + 0.25 e_{t-2}$

$\phi_1 = 0.5 \quad \phi_2 = -0.5 \quad \theta_1 = 0.5 \quad \theta_2 = -0.25$

$\phi_1 + \phi_2 = 0 \not< 1 \quad \phi_2 - \phi_1 = -1 < 1 \quad |\phi_2| = 0.5 < 1$

$\theta_1 + \theta_2 = 0.25 < 1 \quad \theta_2 - \theta_1 = -0.75 < 1 \quad |\theta_2| = 0.25 < 1$

$\therefore$ STATIONARY AND INVERTIBLE $\longrightarrow$ ARIMA(2,0,2)

6.12 $n = 100 \quad r_1 = -0.49 \quad r_2 = 0.31 \quad r_3 = -0.21 \quad r_4 = 0.11 \quad |r_k| < 0.004 \quad k > 4$

$2/\sqrt{100} = 0.2 \rightarrow$ MA(2) or MA(3)? SIMPLER IS BETTER!

Test MA(2)

$$Var(r_k) = \frac{1}{n}\left[1 + 2\sum \rho_j^2\right] \qquad Var(r_3) = \frac{1}{100}\left[1 + 3\left((-0.49)^2 + (0.31)^2\right)\right]$$

$$= 0.0167$$

$r_3 / Var(r_3) = -0.21 / 0.0167 = -1.62 \rightarrow$ keep MA(2)!

NO NEED TO TEST MA(3), MA(2) IS SIMPLER

6.13 $n = 121 \quad \hat{\phi}_{11} = 0.11 \quad \hat{\phi}_{22} = -0.6 \quad \hat{\phi}_{33} = 0.08 \quad \hat{\phi}_{44} = 0.00$

$2/\sqrt{121} = 0.18 \longrightarrow$ AR(2) WORTH TESTING

6.19 a) LAG 1 OF SERIES A WILL BE STRONGLY POSITIVE SINCE 2 POINTS NEXT TO EACH OTHER DONT HAVE A LARGE DIFFERENCE BETWEEN THEM. LAG 1 OF SERIES B WILL BE STRONGLY NEGATIVE SINCE EACH SUBSEQUENT POINT JUMPS TO THE OTHER SIDE OF THE MEAN TO A LARGE DEGREE.

b) LAG 2 OF SERIES A WILL ALSO BE POSITIVE SINCE 2 POINTS THAT ARE A JUMP AWAY FROM EACH OTHER ARE ALSO ON THE SAME SIDE OF THE MEAN. LAG 2 OF SERIES B IS STRONGLY POSITIVE SINCE THE 2 POINTS ARE ON THE SAME SIDE OF THE MEAN AND PRETTY CLOSE TO EACH OTHER.