1. If the sample autocorrelations in a series are $\hat{\rho}_1 = .8$ and $\hat{\rho}_2 = .5$, find asymptotically efficient estimates of the parameters in an AR(2) model. If the variance of the observations is 2.0, estimate the variance of the disturbance term, $\varepsilon_t$. Compute asymptotic standard errors for the estimates of $\phi_1$ and $\phi_2$.

2. Derive a Lagrange Multiplier (LM) test for the null hypothesis that a model is ARMA(1,1) against the alternative that it is ARMA(1,3). How would you carry out a modified LM test based on the F distribution?

3. Given the accompanying graphs of the autocorrelations and partial autocorrelations of the original data for some time series, identify a potential model for each.