March, 13, 1995. Exam 2 for S156: Applied time series analysis

Name: ____________________

1. State whether each of the following model is stationary and/or invertible. Explain your answer briefly. (It suffices to verify the conditions for stationarity and invertibility for the models.)
(a) $X_t = 2 + a_t - 1.5a_{t-1} + .5a_{t-2}$

(b) $X_t - X_{t-1} + .5X_{t-2} = 4 + a_t - .5a_{t-1}$

(c) $X_t - X_{t-1} = a_t - 2a_{t-1}$

2. Consider the following stationary ARMA(1,1) process: $(1 + .5B)X_t = (1 - .2B)a_t$, where (a_t) is iid N(0,1).
(a) Compute the acf for the first five lags.

(b) Find the variance of $W = X_1 + X_2$? (Hint: $\mathrm{var}(X_t) = 1.653$.)

3. Consider two models:

$$\begin{array}{l} A: \; X_t = (1 - .3B - .15B^2 - .075B^3 - .0375B^4 - .01875B^5 - .009375B^6)a_t; \\ B: \; (1 - .5B)X_t = (1 - .8B)a_t. \end{array}$$

(a) Find the ψ weights for the two models.

(b) Are the two models similar? Explain your answer.

4. Suppose that $(1 - B)X_t = 1. + (1 - .4B)a_t$, where $X_0 = 0$ and (a_t) is iid N(0,1).
(a) Find the mean of X_t, for t=0,1,2,3.

(b) Find the variance of X_t, for t=0,1,2,3.