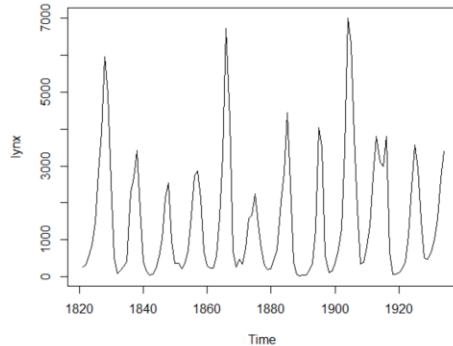


**Instructions:** Answer each question as thoroughly as possible. Round answers to 4 decimal places as needed. Exact answers are best when possible. Be sure to answer all parts of each question.

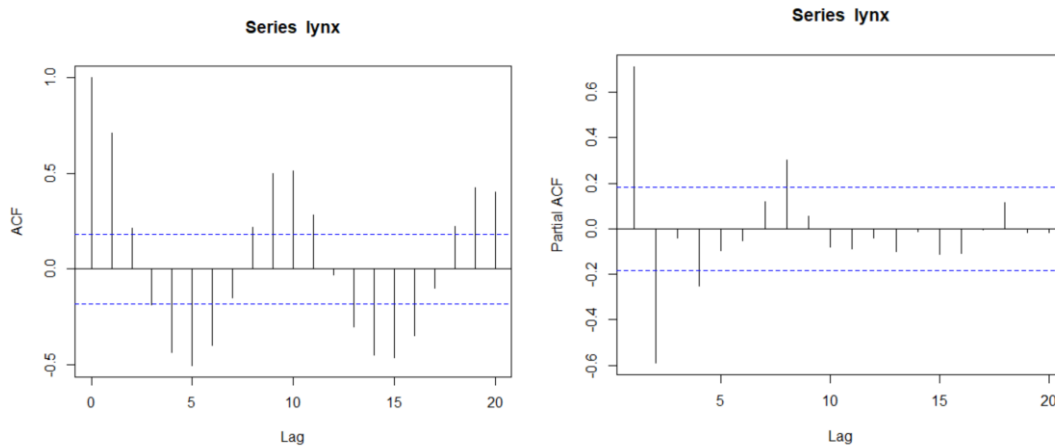
1. Using the built-in data in R called lynx (on lynx populations), perform the following time series analyses.
  - a. Plot the time series. Paste the graph below.



- b. What happens if you use `decompose()` on this data? Describe the results or paste the graph.

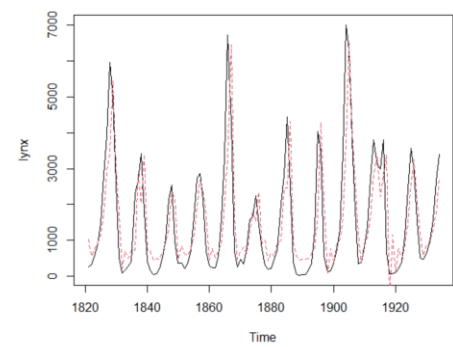
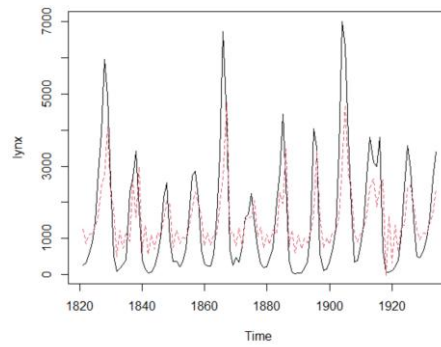
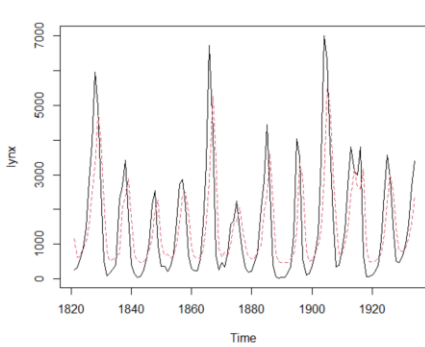
The `decompose()` function does not recognize a seasonal cycle and so it generates an error.

- c. Plot the `acf` and `pacf` graphs. What do you notice?



There does seem to be cyclical behavior with both positive and negative correlations in the ACF, but maybe not evenly spaced cycles. An autoregressive model could work here.

- d. Find an AR model, an MA model, and an ARMA model of the data. Plot the results against the original graph.



e. Use AIC and BIC to determine which model best fits the data.

$AIC(AR) = 1926.991$   
 $AIC(MA) = 1917.947$   
 $AIC(ARMA) = 1891.075$   
 $BIC(AR) = 1935.199$   
 $BIC(MA) = 1926.155$   
 $BIC(ARMA) = 1902.02$

The ARMA model looks to be the best.

f. Plot all three models on the same graph against the original time series. Paste the graph below. You'll need to adjust the plots slightly so that the lines plot in different colors or styles.

