Exercise 3.5 (GNP)

For this problem, use the `gnp` data set.

1. Plot the data.
2. Does it look like it might be helpful to use log transformation? Why?
3. Plot the log data.
4. Does this look stationary? Do you think it might help to first difference?
5. Let $z_t = \log(x_t) - \log(x_{t-1})$, where x_t is the original data. Plot z_t.
6. Plot the acf and pacf for z_t. Does this information suggest a preferred ARMA(p,q) model?
7. Do you notice any seasonality?
8. Finally, try fitting models with various combinations of ARMA(p,q), $(p, q = 0, 1, 2, 3)$. Which model do you prefer?
9. Let's do some diagnostics for your preferred model. Plot the residuals and ACF/PACF of the residuals. Do these look OK? Does the Box-Pierce test reject the null hypothesis of white noise? Look at a normal quantile plot. Do the residuals look normal? Test for normality using Jarque-Bera test.