1. Use the Yule-Walker approach to determine the ACF for an AR(3) model:
   \[ y_t = \phi_1 y_{t-1} + \phi_2 y_{t-2} + \phi_3 y_{t-3} + \epsilon_t \]

2. Re-express the model \((1 - B)y_t = \epsilon_t\) in a form that doesn't involve the backshift operator, B.

3. If you have a model \((1 - \phi B)y_t = (1 - \theta B)\epsilon_t\), express in a form that doesn't involve a backshift operator.

4. Express the AR(3) model using the backshift operator, B.

5. Use backshift operator to re-express the model:
   \[ y_t - y_{t-1} = \phi(y_{t-1} - y_{t-2}) + \epsilon_t \]

6. For forecasting, we require a forecast of our series \(k\) time periods into the future, \(y_{t+k}\), be written in terms of **only** current and past \(y\) values:
   a. With an AR(1) model \(y_t = \phi_1 y_{t-1} + \epsilon_t\):
      i. what is \(\hat{y}_{t+1}\) a forecast of \(y_{t+1}\)? [Note, this is sometimes written as \(\hat{y}_{t+1|t}\), the forecast of \(y\) at time \(t+1\) given information available at time \(t\)]
      ii. What is a forecast of \(y_{t+2}\)? [Or, determine \(\hat{y}_{t+2|t}\)]
      iii. \(y_{t+k}\)?
   b. For an AR(2) model \(y_t = \phi_1 y_{t-1} + \phi_2 y_{t-2} + \epsilon_t\):
      i. what would be a forecast of \(y_{t+1}\)?
      ii. \(y_{t+2}\)?
      iii. \(y_{t+k}\)? [Note: this could be written in terms of

7. For a MA(1) model \(y_t = \epsilon_t - \theta \epsilon_{t-1}\):
   a. re-express with the backshift operator.
   b. Use algebra (for example \(\epsilon_t = y_t + \theta \epsilon_{t-1}\) or \(\epsilon_{t-1} = y_{t-1} + \theta \epsilon_{t-2}\) may help) to re-express the MA(1) model as an AR(\(\infty\)) model.
   c. If \(y_t = (1 - \theta B)\epsilon_t\), will \(\frac{1}{1 - \theta B} y_t = \epsilon_t\)? Explain.
   d. Re-express \(\frac{1}{1 - \theta B}\) in the form \(1 + \pi_1 B + \pi_2 B^2 + \pi_3 B^3 + \cdots\) [i.e. determine the values of \(\pi_1, \pi_2, \text{ etc.}\)]
   e. How do the answers in parts b and d relate to each other?