All notations are from lectures.

1.1 Show that the difference operators $\nabla$ and $\nabla_{12}$ are commutative, that is $\nabla_{12} \nabla = \nabla \nabla_{12}$.

1.2 Show that the difference operator $\nabla \nabla_7$ eliminates a linear trend and a weekly seasonal cycle in a daily time series.

1.3 Write the following operators in terms of a backshift operator $B$:
   a) $\nabla$,
   b) $\nabla_2$,
   c) $\nabla \nabla_3$,
   d) $\nabla \nabla_2 \nabla_3$.

1.4 Apply each of lag-1, lag-2, and lag-3 difference operators to
   a) Linear trend;
   b) Quadratic trend;
   c) Cubic trend.

1.5 Can you formulate a general conjecture based on your results and observations in 1.4? (Hint: Think of what a derivative of respective order would do.)

1.6 Describe two alternative ways of eliminating a linear trend from a time series. Compare and discuss their advantages and disadvantages.