EE424 Homework 9

1) Suppose that the system function of an LTI system is

$$H(z) = \frac{1 + z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - 2z^{-1}\right)\left(1 - 3z^{-1}\right)}$$

   (a) Determine the ROC of H(z) if it is known that the system is stable.
   (b) Determine the ROC of H(z) if it is known that the system is causal.
   (c) Is it possible for the system to be both stable and causal?

2) The input to a causal LTI system is

$$x[n] = \left(\tfrac{1}{4}\right)^n u[n]$$

   The z-transform of the output of this system is

$$Y(z) = \frac{1}{\left(1 - \frac{1}{4}z^{-1}\right)\left(1 - \frac{1}{2}z^{-1}\right)}$$

   (a) Determine the system function H(z), specify the ROC of H(z).
   (b) What is the ROC for Y(z)?
   (c) Determine the output sequence y[n].

3) The system function of a causal LTI system is

$$H(z) = \frac{1 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{3}z^{-1}\right)\left(1 - \frac{1}{2}z^{-1}\right)}$$

   The input to the system is

$$x[n] = \left(\tfrac{1}{4}\right)^n u[n]$$

   Find the output sequence y[n].