Date: 11/14/2016 **Discussion 11** **GSI:** Ming

Prob 1: ROC and system properties

Match the system properties in the left column with the appropriate conditions ont he ROC in the right column:

1.) The system is causal.	A.) All poles of $H(z)$ lie inside of the unit circle.
2.) The system is causal and $H(z)$ is rational.	B.) The order of the numerator of $H(z)$ is not greater than the order of the denominator and the ROC is the exterior of a circle outside the outermost pole.
3.) The system is stable.	C.) The ROC is the exterior of a circle, including infinity.
4.) The system is stable, causal, and $H(z)$ is rational.	D.) The ROC includes the unit circle.

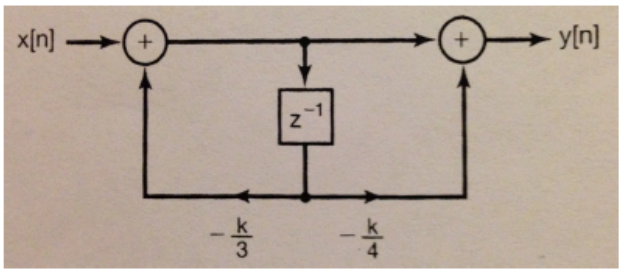
Prob 2: z-transform

Consider the left-sided sequence $x[n]$ with z-transform

$$X(z) = \frac{1}{(1-\frac{1}{2}z^{-1})(1-z^{-1})}.$$

Write $X(z)$ as a ratio of polynomials in z instead of z^{-1}. Determine the ROC, and find $x[n]$.

Prob 3 Consider the filter structure shown below:



a) Find $H(z)$ for this causal filter. Plot the pole-zero pattern and indicate the region of convergence.

b) For what values of the k is the system stable?

c) Determine $y[n]$ if $k = 1$ and $x[n] = (2/3)^n \, \mathrm{u[n]}$

d) Determine, directly from the filter diagram, the difference equation which described this filter.