

Homework No. 8

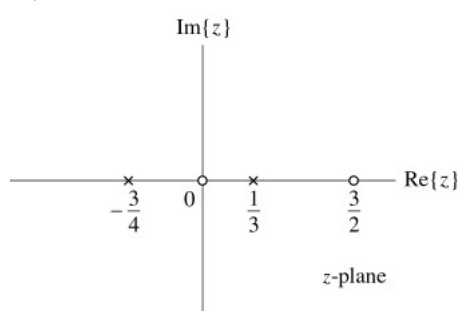
Due 18:10 , June 11, 2009

- 1 Determine the z-transform and sketch the poles, zeros, and ROC in the z-plane for the following time signals: (20%)

(a) $x[n] = u[n]$

(b) $x[n] = \left(\frac{1}{4}\right)^n (u[n] - u[n-5])$

- 2 The location of the poles and zeros of $X(z)$ is depicted in the z-plane in the following figure: (18%)



In the case, identify the valid ROC for $X(z)$, and specify whether the time signal corresponding to the ROC, is right sided, left sided or two-sided.

- 3 Use the method of partial fractions to obtain the time-domain signals corresponding to the following z-transforms: (26%)

(a) $X(z) = \frac{1 + \frac{7}{6}z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 + \frac{1}{3}z^{-1}\right)}, \quad |z| > \frac{1}{2}$

(b) $X(z) = \frac{z^2 - 3z}{z^2 + \frac{3}{2}z - 1}, \quad \frac{1}{2} < |z| < 2$

- 4 Use a power series expansion to determine the time-domain signals corresponding to the following z-transforms: (20%)

(a) $X(z) = \cos(z^{-3}), \quad |z| > 0$

(b) $X(z) = \ln(1 + z^{-1}), \quad |z| > 0$

- 5 With the given system function

$$H(z) = \frac{1 - 2z^{-1}}{1 - \frac{1}{3}z^{-1}}, \quad |z| > \frac{1}{3},$$

does there exist a both causal and stable inverse system for the given one? Why? (16%)