

Causality

Causality of a system is also checked using the transfer function ($H(z)$) of the system such that;

$$H(z) = \sum_{n=-\infty}^{\infty} h[n] z^{-n} \quad \text{if a system is causal then } h[n] = 0 \text{ for } n < 0$$

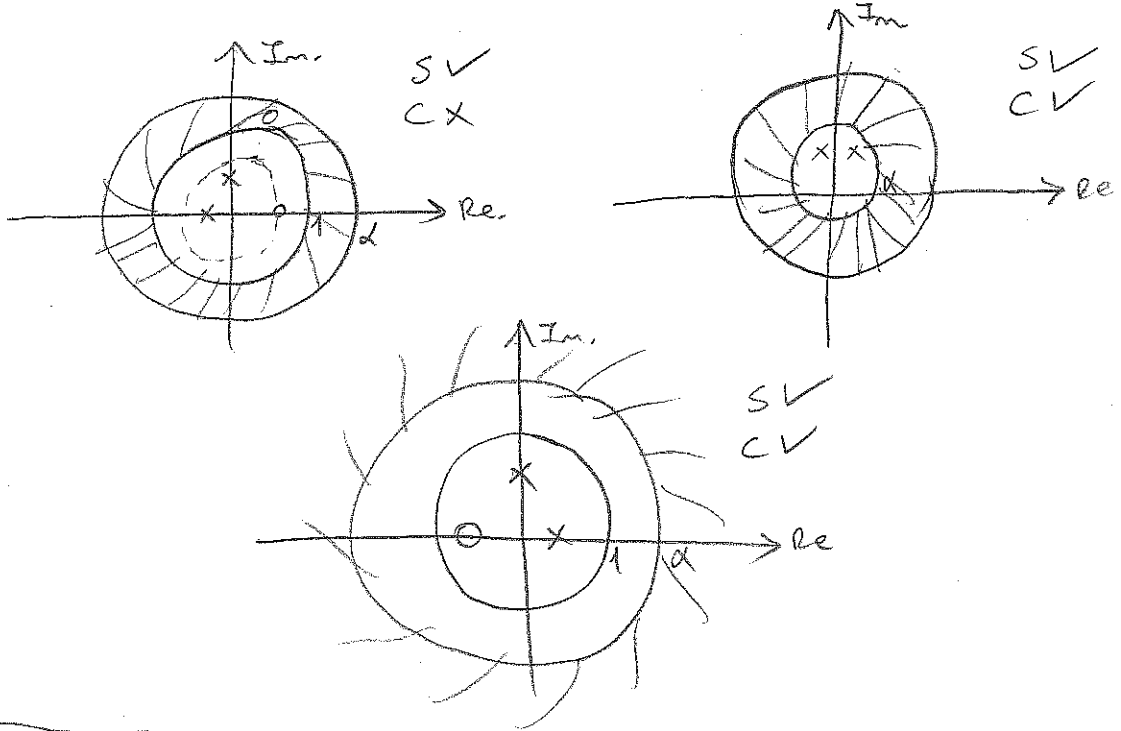
$$H(z) = h[0]z^0 + h[1]z^{-1} + h[2]z^{-2} + \dots$$

$$= 1 + az^{-1} + bz^{-2} + cz^{-3} + \dots$$

ROC for $H(z)$ is in the form $|z| > r_0$ thus, if ROC for only $H(z)$ is in the form $|z| > r_0$ the system is also causal.

Example

Check the given LTI systems for stability and causality.



Property

If the ROC of $x[z]$ contains the unit circle inside then F.T of $x[n]$ also exists; otherwise although z transform exists, its F.T doesn't exist.