$h(t) = e^{-a_1 t} + e^{-a_2 t} + \dots + > 0$

if $a_1 > 0$ then as $t \to \infty$ $h(t) \to \infty$ not stable system

we conclude that;

It is stable if the poles are all on the left half of the S plane if the poles are complex then the real parts of it must be on the left hand side for the stability.

## Causality of LTI Systems

$x(t) \longrightarrow \boxed{\text{LTI System } h(t)} \longrightarrow y(t)$

If S is LTI system and if S is casual then $h(t) = 0$ for $t < 0$

$x(t) * h(t) = y(t) \longrightarrow X(s)H(s) = Y(s)$

$H(s) = \frac{Y(s)}{X(s)} \longrightarrow$ Transfer function of LTI systems.

$X(s) = 0 \longrightarrow$ roots are the poles of $H(s)$ if ROC of $H(s)$ is to the right at the right most pole of $H(s)$ then the system S is casual else; it is non casual.

If $H(s) = \frac{1}{s+1} + \frac{1}{s+2}$ if ROC is $Re\{s\} > -1$ then

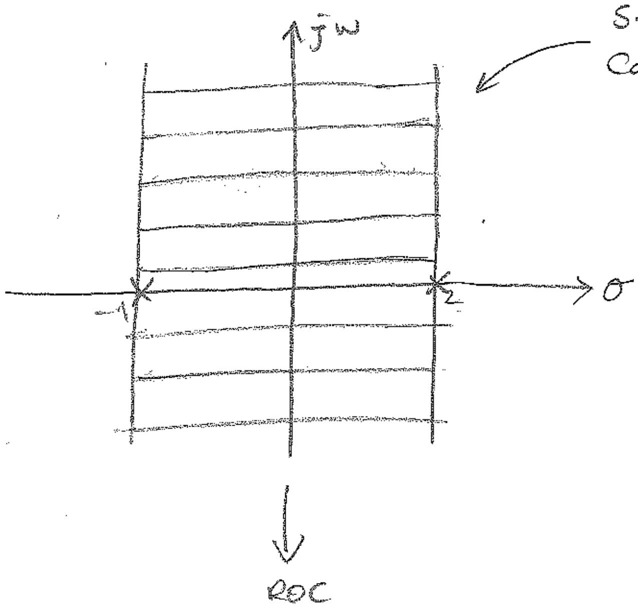
$h(t) = e^{-t}u(t) + e^{-2t}u(t)$

$h(t) = 0$ for $t < 0$ then the systems is casual.

Example

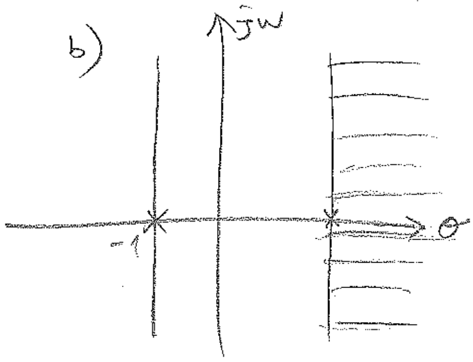
Transfer function zero-pole plot of LTI systems are depicted below. Determine the stability, causality, properties of the system from the given plots.

a)




Stable ☒
Causal ☒

b)




S ✗
C ✓