

Bonus round 3

Given $\lambda > 0$, consider the LTI-system $y = h_\lambda * x$,
where h_λ is right-sided + exp. integrable, with the
property that \forall right-sided + exp. integrable input x ,

$$\text{we have: } \begin{cases} (a_\lambda * y)(t) - 5y'(t) + y(t) = x(t-1) \\ y(0) = y'(0) = 0 \end{cases}, \text{ where } a_\lambda(t) = \begin{cases} e^{\lambda t} & t \geq 0 \\ 0 & t < 0 \end{cases}.$$

Problem: Calculate $h = h_{\lambda/25}$ and determine which $\lambda > 0$
render the system stable.

A detailed and "essentially" correct solution is required to
get 1 bonus point.