April 05, 2018 **CK0191: EX 01**

Exercise 01. Plot the graph of the following function

$$f(t) = \delta_1(t) - (t-2)\delta_1(t-2) + (t-3)\delta_1(t-5).$$

Exercise 02. Consider the following system given in IO representation

$$\dot{y}(t) + y(t) + \alpha = u(t), \quad \alpha \in \mathcal{R}$$

Discuss the linearity and stationarity properties of the systems as a function of the parameter α.

Exercise 03. An IO model has a characteristic polynomial with 3 distinct roots, each of which associates with a stable mode and a time constant that is smaller than 3 $[s]$. Comment on where in the complex plane these roots are located.

Exercise 04. Consider the following linear time-invariant system in IO representation

$$2\frac{\mathrm{d}^2 y(t)}{\mathrm{d}t^2} + 4\frac{\mathrm{d}y(t)}{\mathrm{d}t} + 2y(t) = u(t)$$

Determine and plot the force-free response from $t_0 = 0$ and the following initial conditions

$$y(t)\Big|_{t=t_0} = 1$$
$$\frac{\mathrm{d}y(t)}{\mathrm{d}t}\Big|_{t=t_0} = 1$$