April 11, 2018

CK0191: EX 02

Exercise 01. Consider the linear time-invariant system in IO representation

$$\frac{\mathrm{d}^3 y(t)}{\mathrm{d}t^3} + 6\frac{\mathrm{d}^2 y(t)}{\mathrm{d}t^2} + 13\frac{\mathrm{d}y(t)}{\mathrm{d}t} = 2\frac{\mathrm{d}^2 u(t)}{\mathrm{d}t^2} + 3u(t)$$

1. Determine the characteristic polynomial and its roots;
2. Determine the modes of the system, classify and plot them;
3. Let $t_0 = 0$, determine the force-free evolution from initial conditions

$$y(t)\Big|_{t=t_0} = 1$$
$$\frac{\mathrm{d}y(t)}{\mathrm{d}t}\Big|_{t=t_0} = 1.$$
$$\frac{\mathrm{d}^2 y(t)}{\mathrm{d}t^2}\Big|_{t=t_0} = 1$$

Exercise 02. Consider the linear time-invariant system in IO representation

$$2\frac{\mathrm{d}^2 y(t)}{\mathrm{d}t^2} + 4\frac{\mathrm{d}y(t)}{\mathrm{d}t} + 2y(t) = 3\frac{\mathrm{d}u(t)}{\mathrm{d}} + u(t)$$

1. Define and determine the system's impulse evolution.