CONTROL SYSTEMS

ASSIGNMENT 1

Adyasa Mohanty

IIT HYDERABAD

February 19, 2020

Question

The impulse response of a system is h(t)= t u(t).For an input u(t-1), the output is:

A) $\frac{t^2}{2}u(t)$ B) $\frac{t(t-1)}{2}u(t-1)$ C) $\frac{(t-1)^2}{2}u(t-1)$ D) $\frac{t^2-1}{2}u(t-1)$

Solution

Laplace Transform

$$F(s) = \int_0^\infty f(t) \frac{1}{e^{(st)}} dt$$

f(t)	F(s)
1	$\frac{1}{s}$
t	$\frac{1}{s^2}$
$u(t)$	$\frac{1}{s}$

Solution

Impulse response of system is h(t)= tu(t)

Input x(t)=u(t-1)

The output will be y(t)= x(t)*h(t)

Taking Laplace transform on both the sides we get

$$Y(s) = X(s)H(s) = \frac{1}{se^s} \times \frac{1}{s^2} = \frac{1}{s^3 e^s}$$

Solution

Taking the inverse Laplace Transform we get

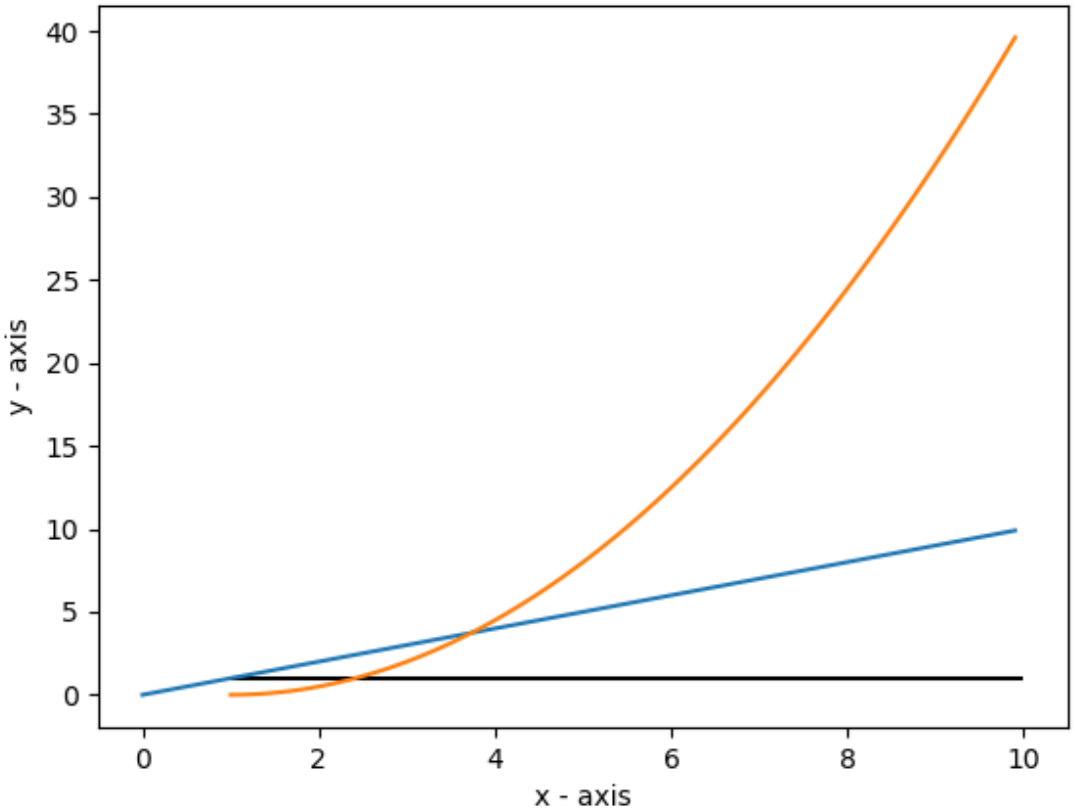
$$y(t) = p(t-1)$$

where p(t)= parabolic function

$$\frac{1}{s^3} = \frac{t^2}{2}u(t)$$

$$\frac{1}{e^s s^3} = \frac{(t-1)^2}{2}u(t-1)$$

Solution



Solution