Chapter2

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2.1

What we know is the linear system must obey the superposition property.
The input-output description in Fig2.1(a) is :$y = a * u$
Here a is a constant. It is easy to find system(a)is a linear system.
The input-output description in Fig2.1(b) is:$y = a*u+b$ Here a and b are all constants. Testify whether it has the property of additivity.
Let:

$$y_1 = a * u_1 + b.$$

$$y_2 = a * u_2 + b.$$

then:

$$(y_1 + y_2) = a * (u1 + u2) + 2 * b.$$

so it does not satisfy the property of addivity,therefore,it is not a linear system The system in Fig2.1(c) is obviously a nonlinear system .
when system(b) introduce $y - y_0$ for the new output,system be is the linear.

2.2

Because $g(t)$ is not zero,when $t < 0$,so the ideal lowpass filter is not causal and the ideal filter can't bulid in the real world

2.3

It is easy to testify the system is a linear system.
Testify whether the system is time-invariable.
Define the initial time of input t_0,system input is $u(t)$,$t \geq t_0$,so it decides the output $y(t)$,$t \geq t_0$:

$$y(t) = \begin{cases} u(t), & for \quad t_0 \leq t \geq \alpha \\ 0, & for \quad t \geq \alpha. \end{cases} \tag{1}$$