

# 2.1

The system in Figure 2-1 is known to be *time invariant*. When the inputs to the system are , , and , the responses of the system are , , and , as shown.

*T*

-3 -2 -1 0 1 2 3 4 n

3

2

1

2

4

2

-3 -2 -1 0 1 2 3 4 n

-3 -2 -1 0 1 2 3 4 n

2

-5 -4 -3 -2 -1 0 1 2 n

1

2

3

-3 -2 -1 0 1 2 3 4 n

-3 -2 -1 0 1 2 3 4 n

Figure 2-1

1. Determine whether the system *T* could be linear.
2. If the input to the system *T* is , what is the system response ?
3. What are all possible inputs for which the response of the system T can be determined from the given information alone?

# 2.2

For the system in Figure 2-2, determine the output when the input of is and is an ideal lowpass filter as indicated, i.e.,

+

1

Figure 2-2

# 2.3

An ideal lowpass filter with zero delay has impulse response and frequency response

1. A new filter is defined by the equation

Determine an equation for the frequency response of ,and plot the equation for . What kind of filter is this?

1. A second filter is defined by the equation

Determine the equation for the frequency response , and plot the equation for . What kind of filter is this?

1. A third filter is defined by the equation

Determine the equation for the frequency response , and plot the equation for . What kind of filter is this?