Problem #1

1. Memoryless 2. Time Invariant 3. Linear 4. Causal 5. Stable

(b) with time shift not memoryless

$T\{x[n]\} = x[n-2] - 2x[n-8]$

$T\{x[n-n_0]\} = x[n-n_0-2] - 2x[n-n_0-8] = y[n-n_0]$ time-invariant

$T\{\alpha x_1[n] + \beta x_2[n]\} = \alpha x_1[n-2] - 2\alpha x_2[n-8] + \beta x_2[n-2] - 2\beta x_2[n-8]$

$= \alpha y_1[n] + \beta y_2[n]$ linear

righ shift hence causal

stable as output is bounded

(e) with time shift not memoryless

$$T\{x[n-n_0]\} = \begin{cases} x[n-n_0] & n \geq 1 \\ 0 & n=0 \\ x[n-n_0+1] & n \leq -1 \end{cases}$$

$$y(n-n_0) = \begin{cases} x[n-n_0] & n-n_0 \geq 1 \\ 0 & n-n_0 = 0 \\ x[n-n_0+1] & n-n_0 \leq -1 \end{cases}$$

time-variant

$T\{\alpha x_1[n] + \beta x_2[n]\} = \alpha y_1[n] + \beta y_2[n]$ linear

right shift not causal

stable, as output is bounded

(g) with scale and time-shift not memoryless

$T\{x[n-n_0]\} = x[4n+1-n_0]$ time-variant

$y[n-n_0] = x[4n-4n_0+1]$

$T\{\alpha x_1[n] + \beta x_2[n]\} = \alpha y_1[n] + \beta y_2[n]$ linear right shift not causal

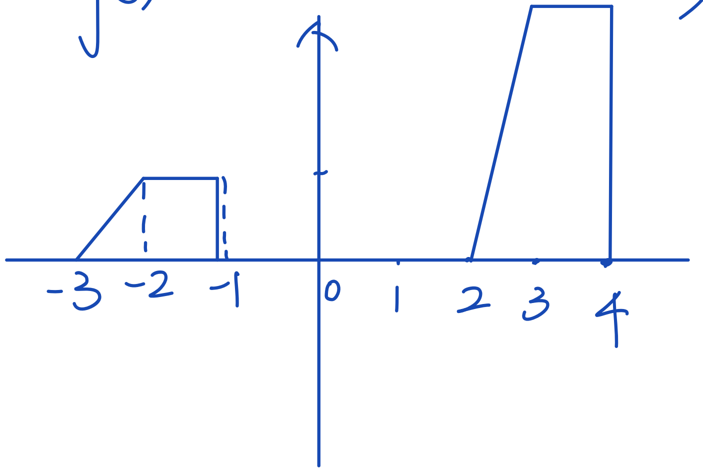
stable as output is bounded

Problem #2.

$$x(t)\cdot h(t) = x(t)\left(\delta(t)+\delta(t-10)\right)$$
$$= x(t)\,\delta(t) + x(t)\,\delta(t-10)$$
$$= x(t) + x(t-10)$$

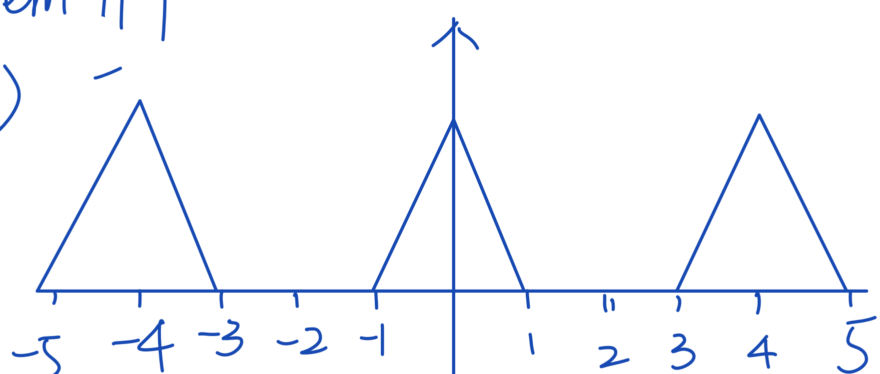
Problem #3.

$$y(t) = x_1(t) \cdot x_2(t)$$
$$= \cancel{1}$$
$$x_1(t) = \delta(t+2) + 3\,\delta(t-3)$$
$$y(t) = 1\cdot x(t+2) + 3\cdot x(t-3)$$

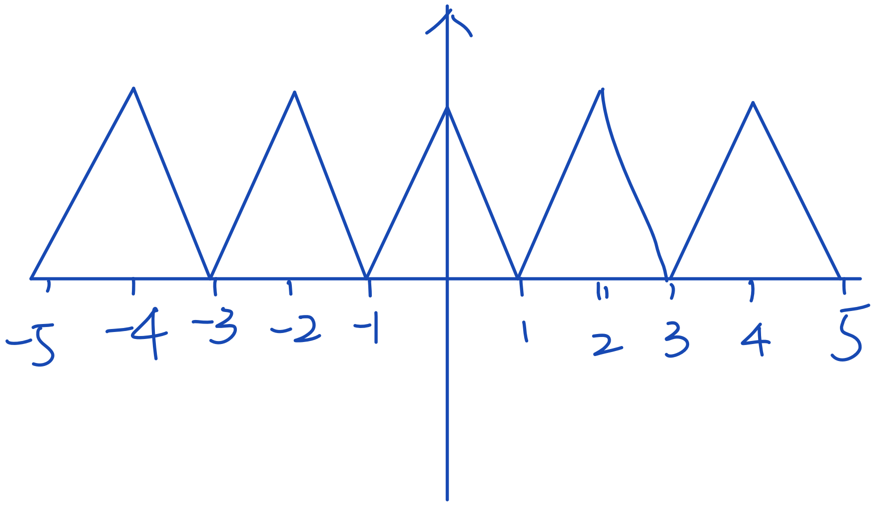


Problem #4

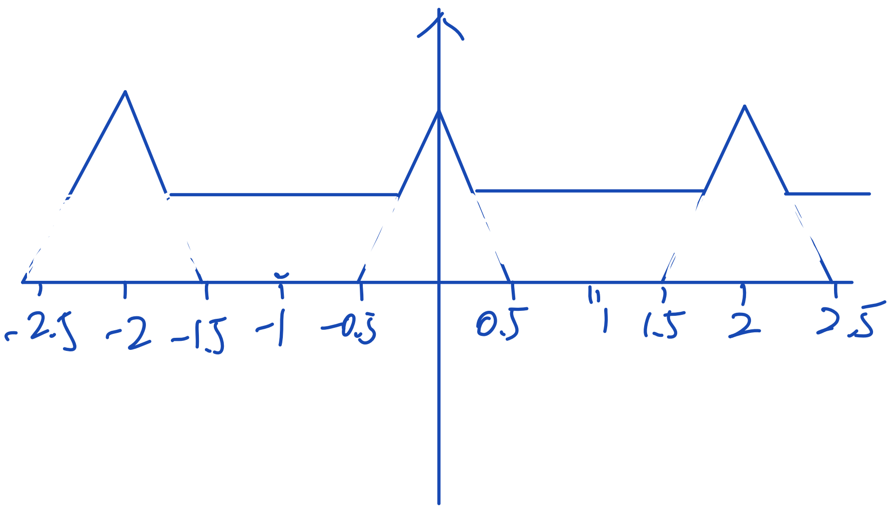
(a)



(b)



(c)



(d)