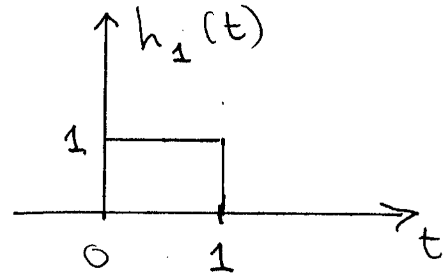
Solution to Exam 1 SP'08 ECE 301

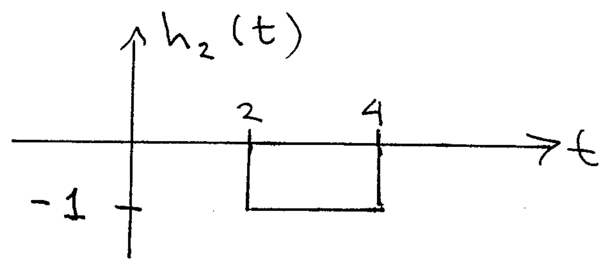
Prob. 1 (a)



(b) $h_1(t) = 0$ for $t < 0 \Rightarrow$ causal

(c) $\int_{-\infty}^{\infty} |h_1(t)|\, dt = \int_0^1 (1)\, dt = 1 < \infty \Rightarrow$ stable!

(d)

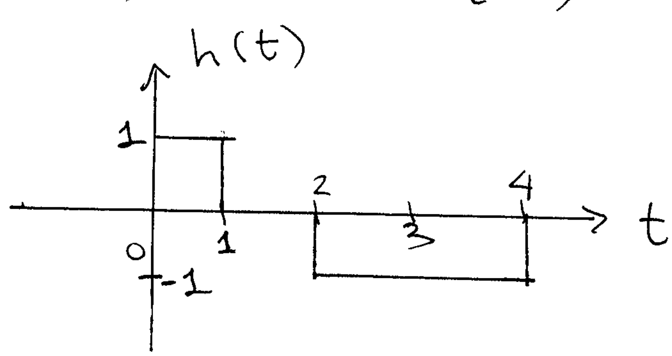


(e) $h_2(t) = 0$ for $t < 0 \Rightarrow$ causal

(f) $\int_{-\infty}^{\infty} |h_2(t)|\, dt \leq \int_2^4 (1)\, dt = 4-2 = 2 < \infty$

$\Rightarrow$ stable

(g) $h(t) = h_1(t) + h_2(t)$



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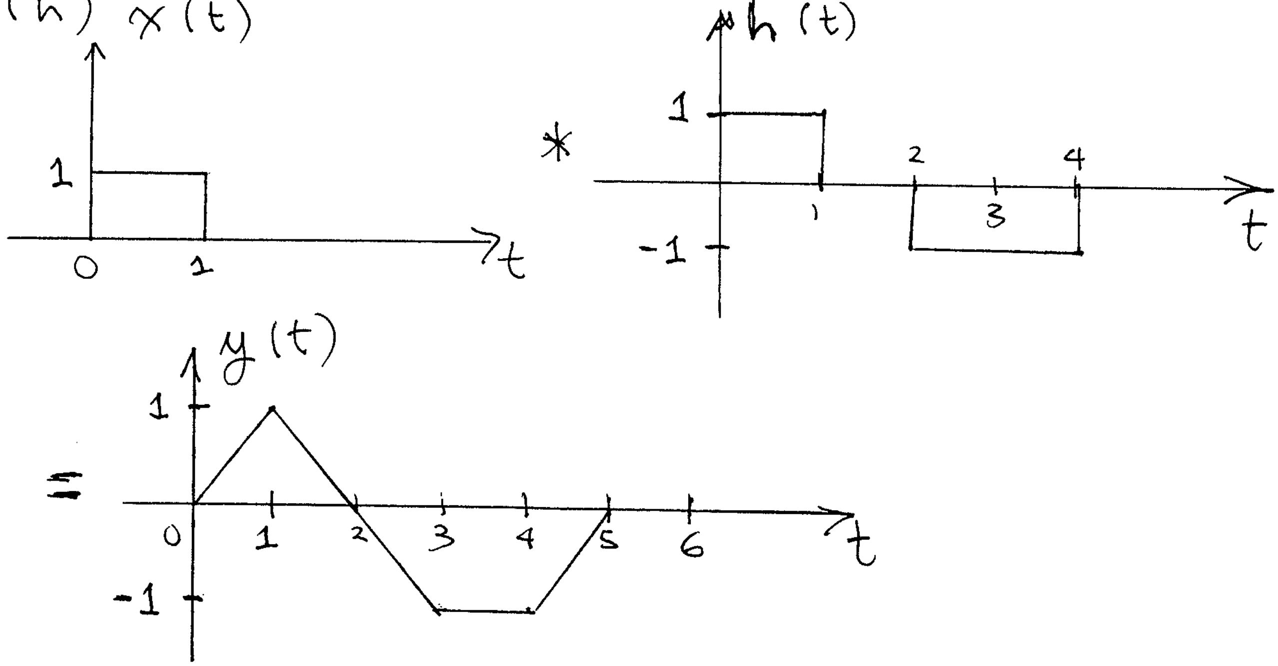
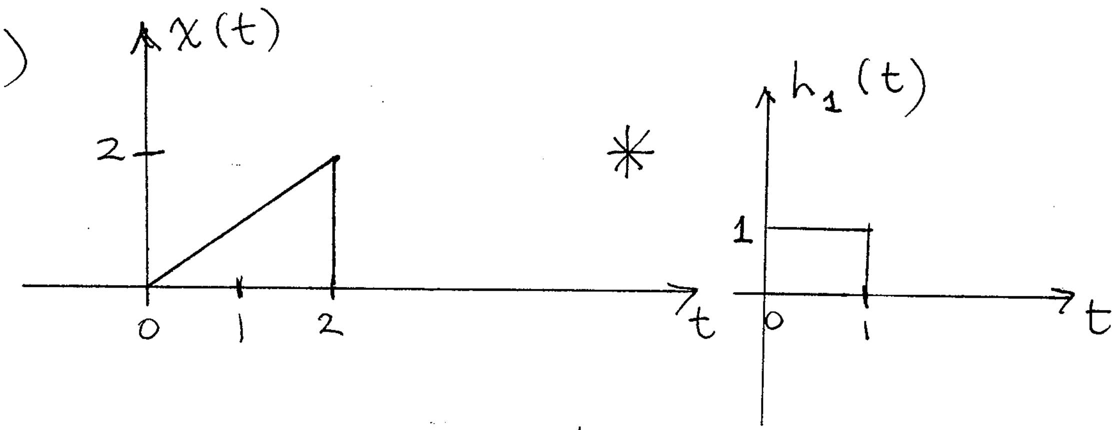
(h)



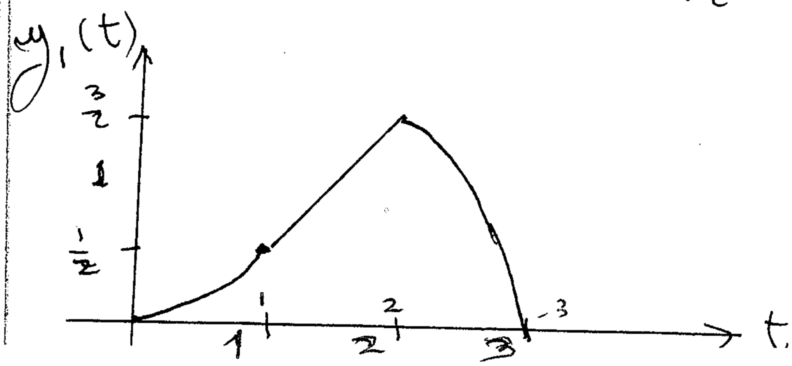
(i)



This is identical to Example 2.7 on pg. 99 with $T = 1$:

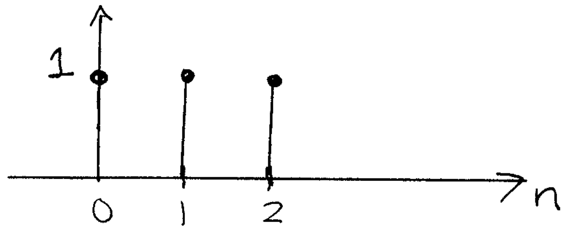
$$y(t) = \begin{cases} 0, & t<0 \\ \frac{1}{2}t^2, & 0<t<1 \\ t-\frac{1}{2}, & 1<t<2 \\ -\frac{1}{2}t^2+t+\frac{3}{2}, & 2<t<3 \\ 0, & t>3 \end{cases}$$

Similar to Fig. 2.21 on pg. 101



Prob. 2 Sol'n. ECE 301 SP'08

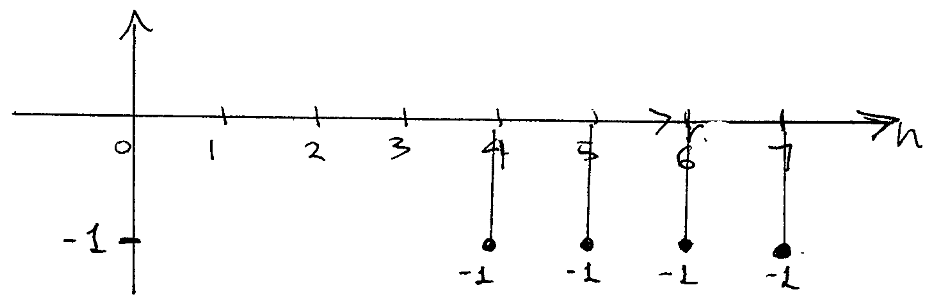
(a) $h_1[n] = \delta[n] + \delta[n-1] + \delta[n-2]$



(b) $h_1[n] = 0$ for $n < 0$ $\Rightarrow$ causal

(c) $\displaystyle\sum_{n=-\infty}^{\infty} |h_1[n]| \leq 1+1+1 = 3 < \infty$ $\Rightarrow$ stable

(d) $h_2[n] = -\delta[n-4] - \delta[n-5] - \delta[n-6] - \delta[n-7]$

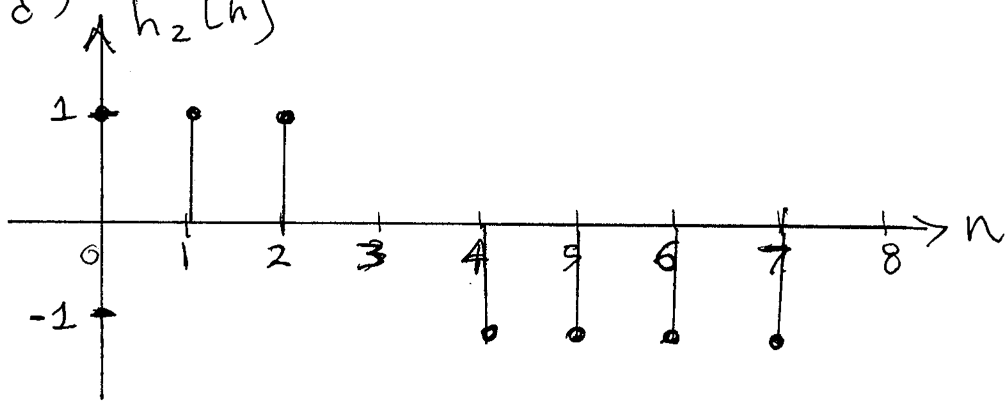


(e) $h_2[n] = 0$ for $n < 0$ $\Rightarrow$ causal

(f) $\displaystyle\sum_{n=-\infty}^{\infty} |h_2[n]| = |-1| + |-1| + |-1| + |-1| = 4 < \infty$

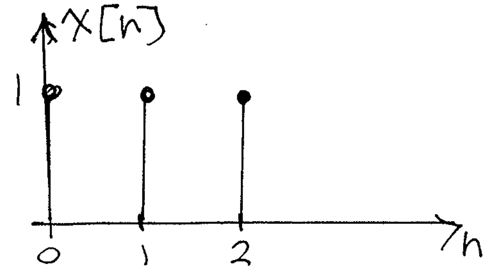
$\Rightarrow$ stable

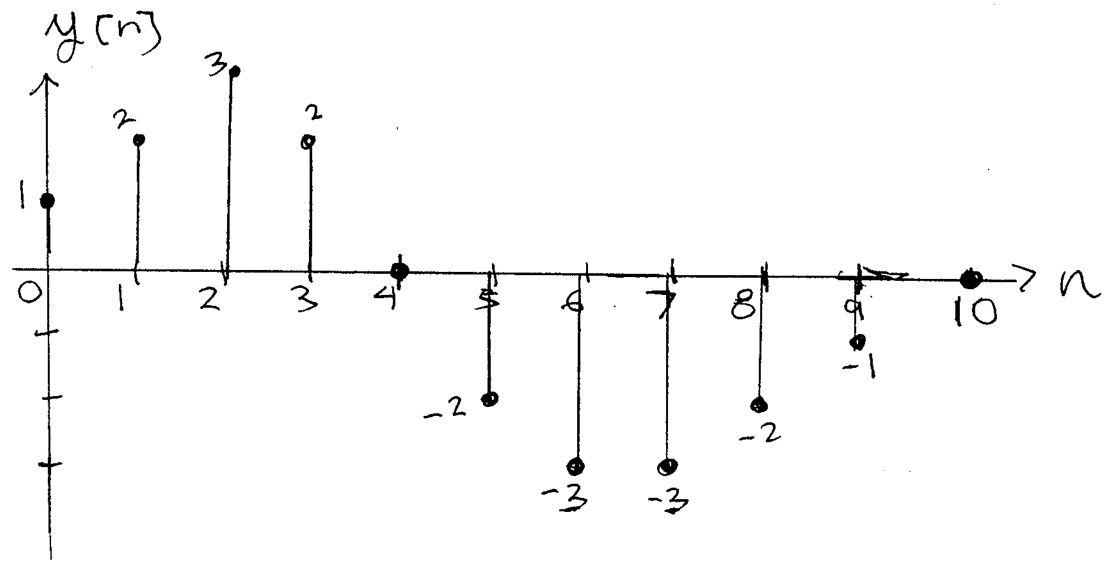
(g)



ECE Prob. 2

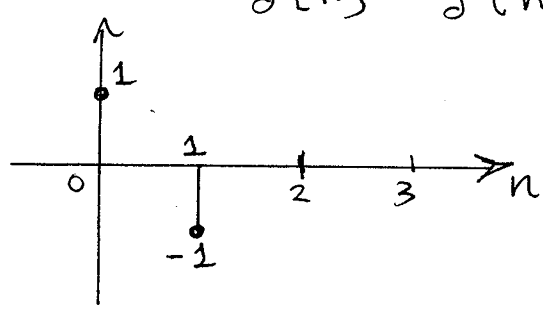
(h)





(i) $x[n] = (-1)^n \{u[n] - u[n-2]\}$

$= \delta[n] - \delta[n-1]$



$y[n] = x[n] * h[n] = (\delta[n] - \delta[n-1]) * h[n]$

$= h[n] - h[n-1]$