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Homework #1

From the 3rd Edition:

2.18

(a) causal, because u[n] = 0 when n < 0

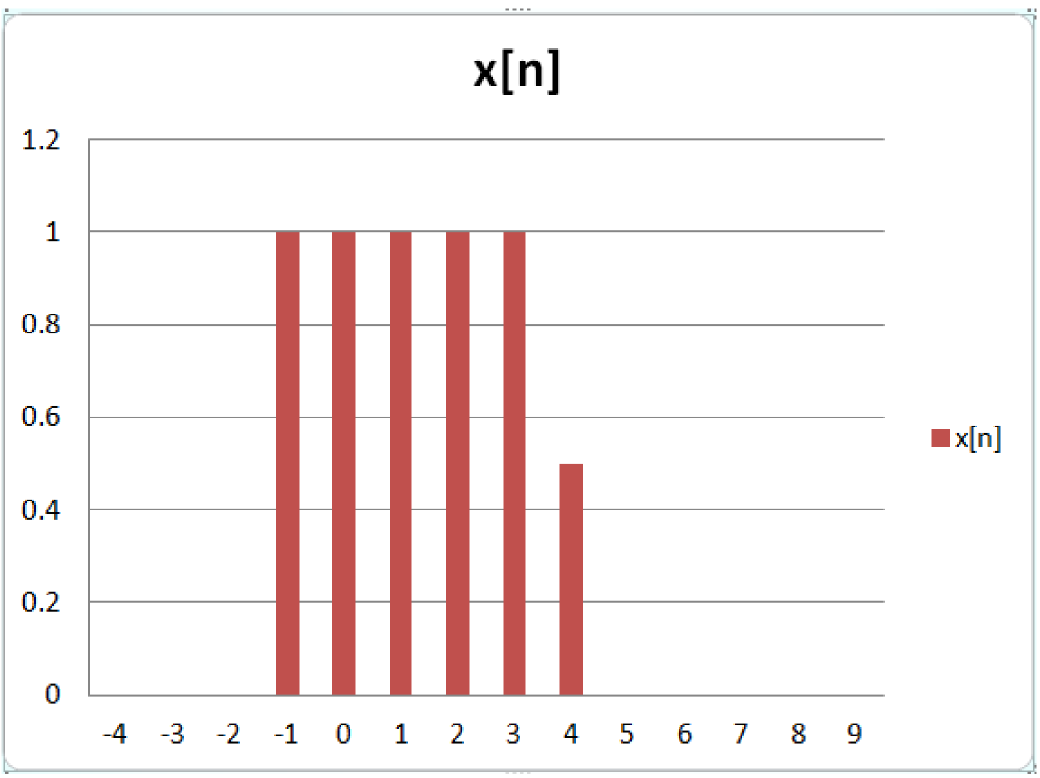
(b) causal, because u[n] = 0 when n < 0 and h[0] = (1/2)^n u[-1]

(c) non-causal, because h[-1] = (1/2)^1 = .5 ~= 0

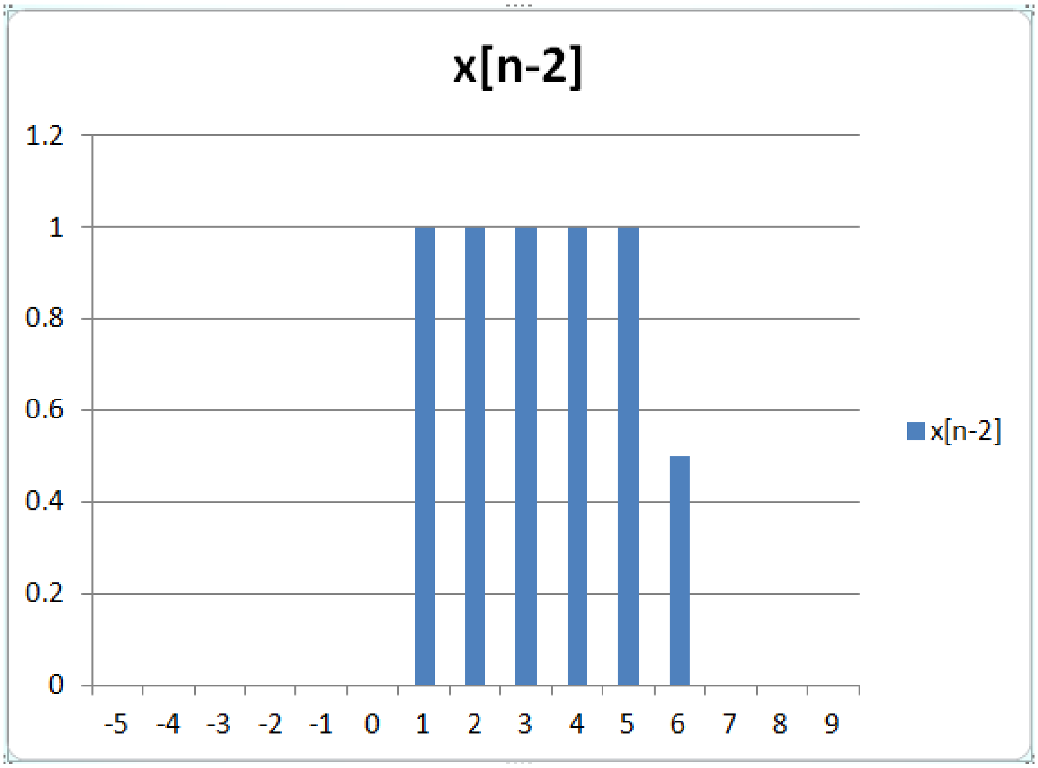
(d) non-causal, because h[-1] = u[1] – u[-3] = 1 – 0 = 1 ~= 0

(e) non-causal, because h[-1] = 3*u[-1] + (1/3)*u[0] = (1/3) ~= 0

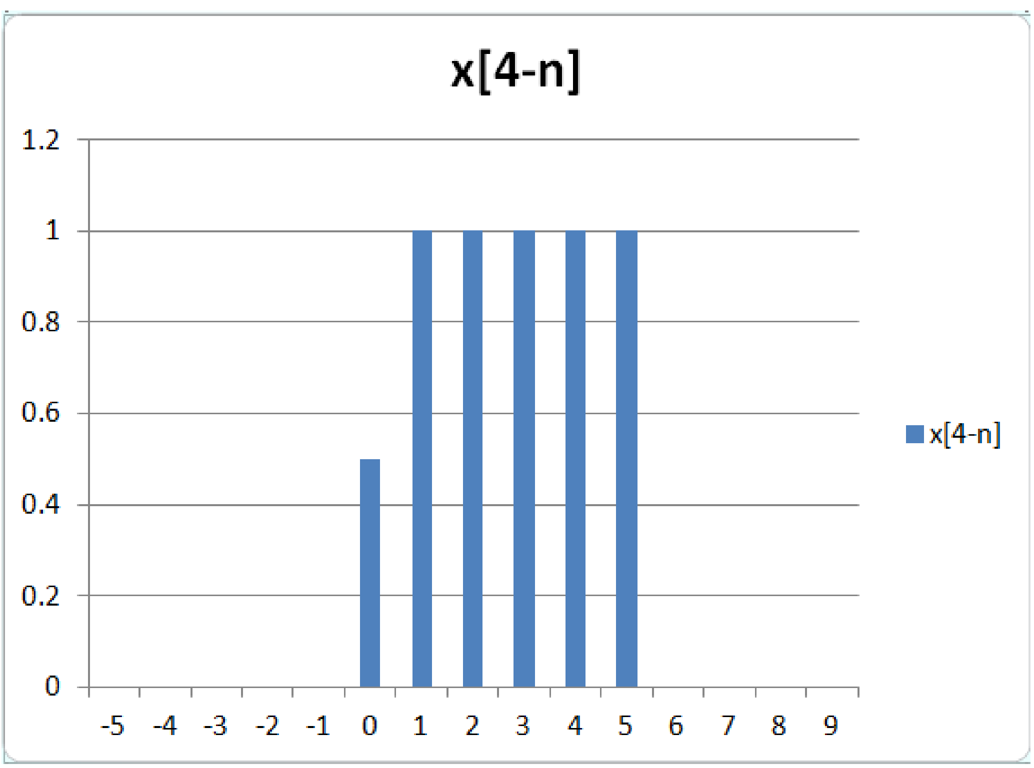
2.21



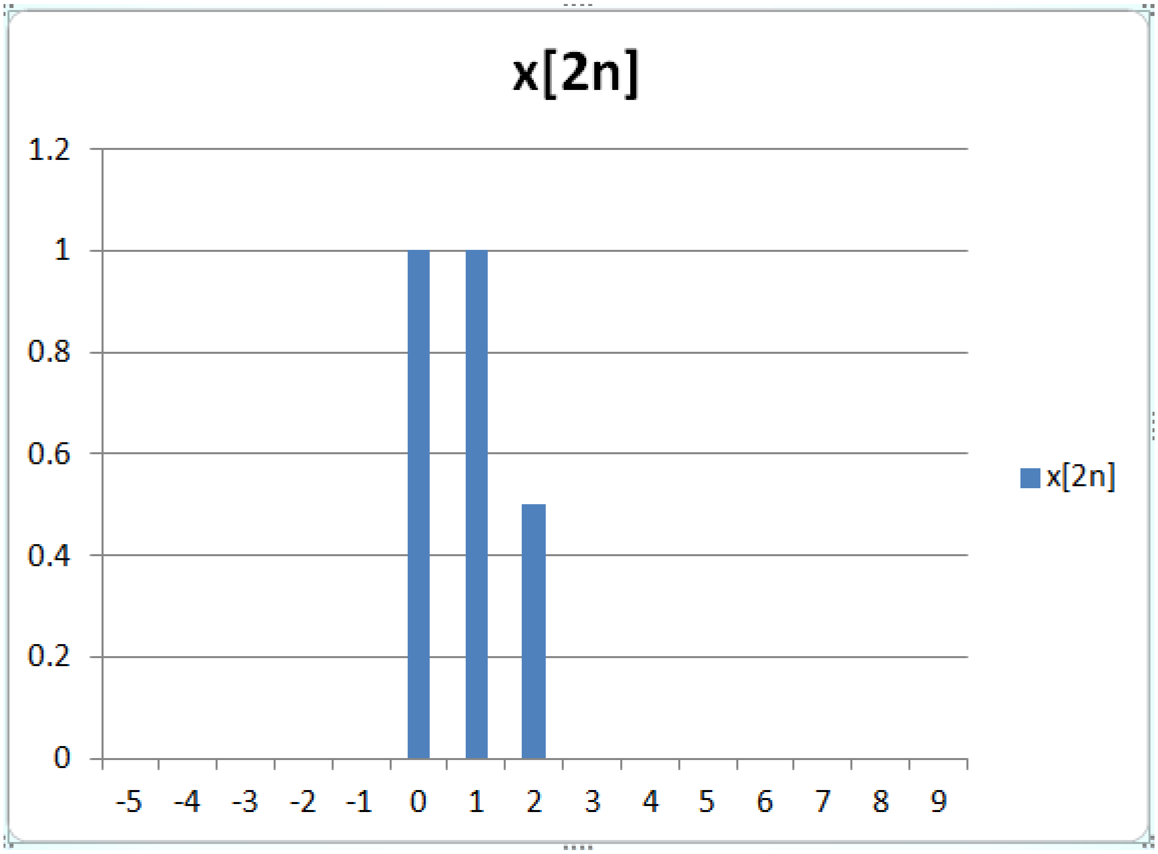
(a)


x[n-2]
1.2
1
0.8
0.6
0.4
0.2
0
-5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
x[n-2]

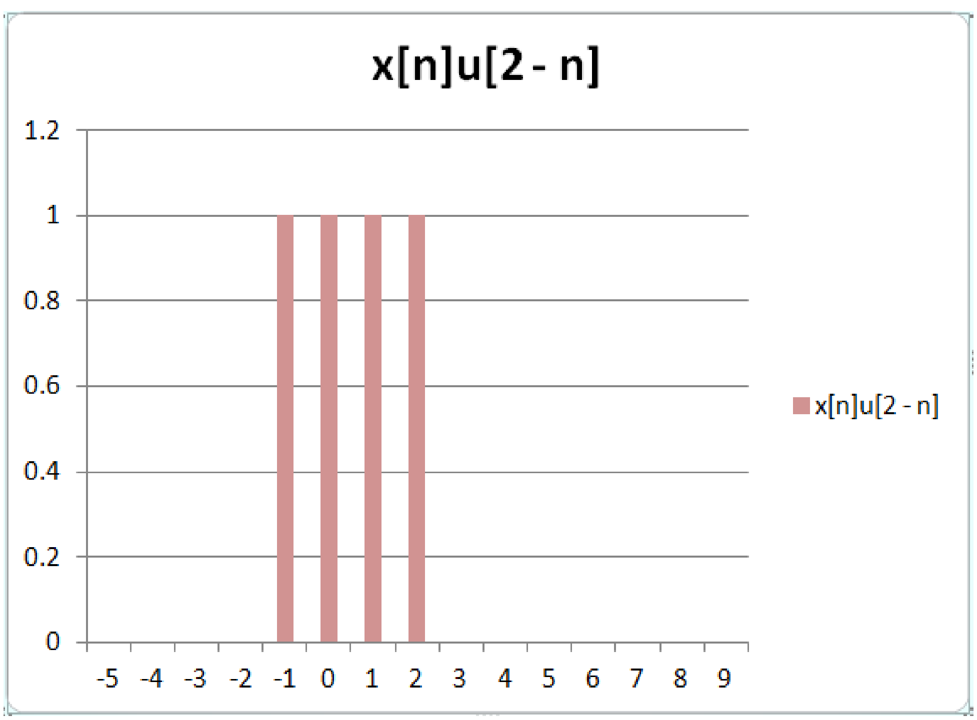
(b)


x[4-n]
1.2
1
0.8
0.6
0.4
0.2
0
-5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
x[4-n]

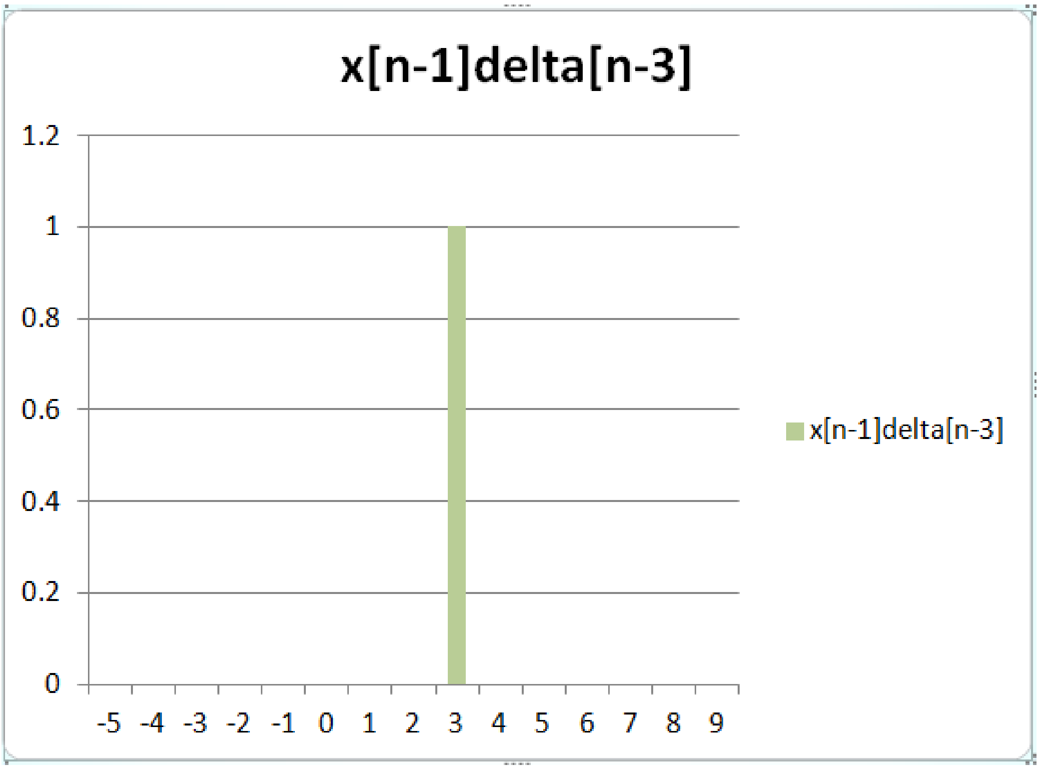
(c)


x[2n]
1.2
1
0.8
0.6
0.4
0.2
0
-5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
x[2n]

(d)


x[n]u[2 - n]
1.2
1
0.8
0.6
0.4
0.2
0
-5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
x[n]u[2 - n]

(e)



2.49

(a) I understand the definition of LTI systems, but I could not find any examples that illustrated how to approach this question in the book or slides. I could not attend recitation, and Clive tried to help over email with little success. My confusion is centered around not understanding how to combine the inputs into a single input.

(b)

2.58

(a)

h[n] = delta[n] + 2 * delta[n - 1] + delta[n – 2]

n < 0 : h[n] = 0

n == 0 : h[n] = 1

n == 1 : h[n] = 2

n == 2 : h[n] = 1

n > 2 : h[n] = 0

(b) Yes. It is stable because h[n] is absolutely summable to 4.

(c)

$H(e^{jw}) = \sum$ (delta[n] + 2 * delta[n - 1] + delta[n – 2]) * e^{-jwn}

$H(e^{jw}) = (1) * e^{-jw0} + (2) * e^{-jw1} + (1) * e^{-jw2}$

$H(e^{jw}) = 1 + 2e^{-jw} + e^{-jw2}$

$H(e^{jw}) = 1 + e^{-jw} (2 + e^{-jw})$

The only trigonometric identity I saw used in the text was converting $e^{jwx} – e^{-jwx}$ to sin[ωx] but that doesn't seem to apply here.

(d)

(e)