Problem 1:

Consider the following difference equation:

*y*[*n*] -5/6 *y*[*n*-1] +1/6 *y*[*n*-2] = *x*[*n*]

(a). Determine the impulse response *h*[*n*] for the LTID system.

(b). Is the system stable? Is the system causal?

(c). Determine the output *y*[*n*] if *x*[*n*] = (1/5)*nu*[*n*].

Problem 2:

Determine the following convolutions:

(a). *u*[*n*] \* *u*[*n*]

(b). *x*[*n*] \* *δ*[*n*]

(c). (*u*[*n*] - *u*[*n-*10]) \* (*u*[*n*] - *u*[*n-*3]) (show it graphically)

(d). (1/2)*n u*[*n*] \* (1/3)*n u*[*n*]

Problem 3:

Using the commutative and associative properties to prove that for two concatenated LTID systems *h*1[*n*] and *h*2[*n*], we can switch their order without changing the overall system. i.e.,

*h*2[*n*]

*h*1[*n*]

is equivalent to

*h*1[*n*]

*h*2[*n*]

Problem 4:

Prove the shifting property of convolution:

If *x*1[*n*]\* *x*2[*n*] = *c*[*n*], then *x*1[*n-m*]\* *x*2[*n-p*] = *c*[*n-m-p*], where \* denotes “convolution”