1a) $y[n] + .2y[n-1] = x[n] - x[n-1]$

$h[n] + .2h[n-1] = \delta[n] - \delta[n-1]$

$h[0] = -.2h[-1] + \delta[0] - \delta[-1] = 1$

$h[1] = -.2h[0] + \delta[1] - \delta[0] = -.2 - 1 = -1.2$

$h[2] = -.2h[1] = 0.24$

$h[3] = -.2h[2] = -0.048$

$\vdots$

$h[n] = (-.2)^{n-1}(-1.2) \quad \text{for } n \geq 1$

b) $y[n] + 1.2y[n-1] = 2x[n-1]$

$h[n] + 1.2h[n-1] = 2\delta[n-1]$

$h[0] = -1.2h[-1] + 2\delta[-1] = 0$

$h[1] = -1.2h[0] + 2\delta[0] = 2$

$h[2] = -1.2h[1] + 2\delta[1] = -1.2(2)$

$h[3] = -1.2h[2] = (-1.2)^2(2)$

$\vdots$

$h[n] = (-1.2)^{n-1}(2) \quad \text{for } n \geq 1$

c) $y[n] = 0.24\,(x[n] + x[n-1] + x[n-2] + x[n-3])$

$h[n] = 0.24\,(\delta[n] + \delta[n-1] + \delta[n-2] + \delta[n-3])$

$= \begin{cases} 0.24 & 0 \le n \le 3 \\ 0 & \text{otherwise} \end{cases}$

d) $y[n] = x[n] + .5\,x[n-1] + x[n-2]$

$h[n] = \delta[n] + .5\,\delta[n-1] + \delta[n-2]$

$h[n] = \underset{\substack{\uparrow \\ n=0}}{[1} \;\; .5 \;\; 1]$, $h[n]=0$ all other n

2. a) $x[n] = u[n] - u[n-4]$, $v[n] = 0.5^n u[n]$

$$x[n] * v[n] = \sum_{k=-\infty}^{\infty} x[k]\, v[n-k]$$

$$= \sum_{k=-\infty}^{\infty} \left(u[k] - u[k-4]\right) 0.5^{n-k} u[n-k]$$

if $0 \le n \le 4$

$$= \sum_{k=0}^{n} 0.5^{n-k} = 0.5^n \frac{1-2^{n+1}}{1-2} = -(0.5^n - 2)$$

if $4 < n$

$$= \sum_{k=0}^{4} 0.5^{n-k} = 0.5^n \frac{1-2^5}{1-2} = -0.5^n + 0.5^{n-5}$$

b) $x[n] = [1 \quad 4 \quad 8 \quad 2],\ v[n] = [0 \quad 1 \quad 2 \quad 3 \quad 4]$

$x[n]$	1	4	8	2	0	0	0	0	0
$v[n]$	0	1	2	3	4	0	0	0	0
	0	1	2	3	4	16	32	8	
		0	4	8	12	24	6		
			0	8	16	4			
				0	2				

$$y[n] = [\underset{\substack{\uparrow \\ n=0}}{0} \quad 1 \quad 6 \quad 19 \quad 34 \quad 44 \quad 38 \quad 8 \quad 0]$$

c) $x(n) = u[n],\ v[n] = 2(.8)^n u[n]$

$$x[n] * v[n] = \sum_{k=-\infty}^{\infty} u[k] 2 .8^{n-k} u[n-k]$$

$$= \sum_{k=0}^{n} 2(.8)^{n-k}$$

$$= 2(.8)^n \sum_{k=0}^{n} .8^{-k} = 2(.8)^n \frac{1 - 1.25^{n+1}}{1 - 1.25}$$

$$= -8[0.8^n - 1.25], \quad n \geq 0$$

$$= -8(.8)^n + 10, \quad n \geq 0$$

d)

$$y[n] = \sum_{k=-\infty}^{\infty} u[k-1]\, 2\, (.5)^{n-k} u[n-k]$$

$$= \sum_{k=1}^{n} 2\, (.5)^{n-k} \qquad , \; n \geq 1$$

$$= 2\, (.5)^{n} \sum_{k=1}^{n} 2^{k}$$

$$= 2\, (.5)^{n} \left(\sum_{k=0}^{n} 2^{k} - 1 \right)$$

$$= 2\, (.5)^{n} \left[\frac{1-2^{n+1}}{1-2} - 1 \right]$$

$$= 2\, (.5)^{n} \left(-2 + 2^{n+1} \right)$$

$$= -(.5)^{n-2} + 4 \quad , \; n \geq 1$$