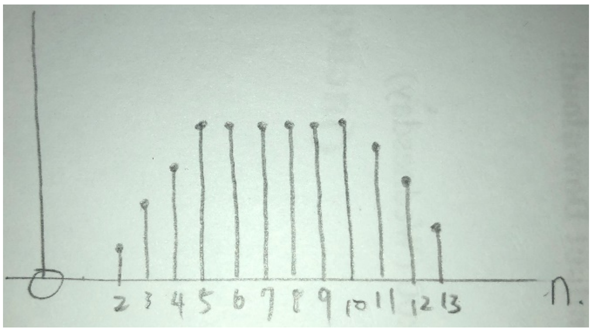
1. h[n] = u[n] - u[n-9], x[n] = u[n-2] – u[n-6]
   y[n] = x[n]*h[n] = u[n-2]*u[n] – u[n-2]*u[n-9] – u[n-6]*u[n] + u[n-6]*u[n-9]
   $= \sum_{k=-\infty}^{\infty} u[k-2]u[n-k]$ - $\sum_{k=-\infty}^{\infty} u[k-2]u[n-k-9]$
   $- \sum_{k=-\infty}^{\infty} u[k-6]u[n-k]$ + $\sum_{k=-\infty}^{\infty} u[k-6]u[n-k-9]$
   = (n-1)u[n-2] – (n-10)u[n-11] – (n-5)u[n-6] + (n-14)u[n-15]

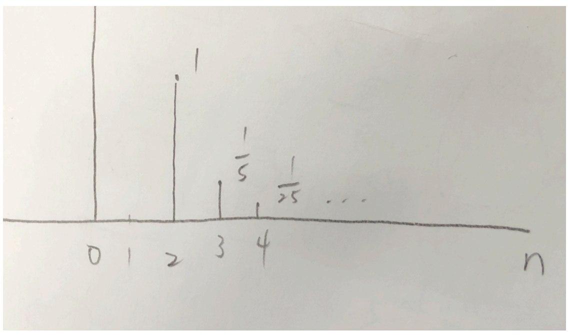



2. (a). x(t) = u(t-3) – u(t-6), h(t) = $e^{-2t}u(t)$
   y(t) = x(t)*h(t) = h(t)*x(t) = $e^{-2t}u(t) * u(t-3)$ - $e^{-2t}u(t) * u(t-6)$
   $= \int_{-\infty}^{\infty} e^{-2\tau}u(\tau)u(t-\tau-3)d\tau$ - $\int_{-\infty}^{\infty} e^{-2\tau}u(\tau)u(t-\tau-6)d\tau$
   $= 1/2(1-e^{-2(t-3)})u(t-3)$ - $1/2(1-e^{-2(t-6)})u(t-6)$ –from example 2.6

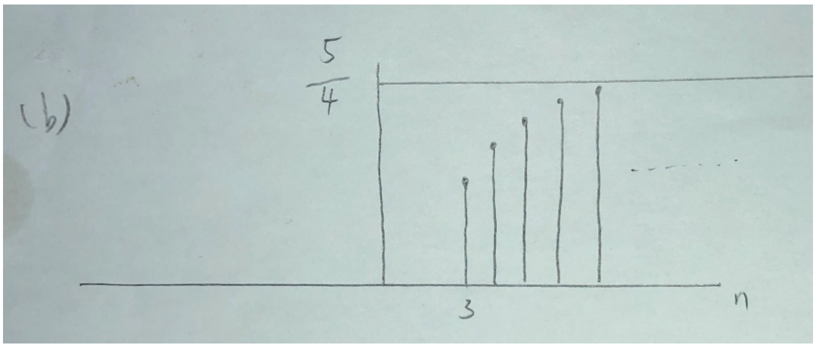
   (b). g(t) = $\frac{d(x(t))}{dt} * h(t) = \left(\delta(t-3) - \delta(t-6)\right) * h(t)$ = h(t-3) – h(t-6)
   $= (e^{-2(t-3)}u(t-3))$ - $(e^{-2(t-6)}u(t-6))$

3. (a). False, if y[n] = x[n]*h[n], then y[n-1] = x[n-1]*h[n] or x[n]*h[n-1]
   (b). $y(t) = \int_{-\infty}^{t} e^{-(t-\tau)}x(\tau-5)d\tau = \int_{-\infty}^{t} e^{-(t-\tau)}\left(x(\tau) * \delta(\tau-5)\right)d\tau =$
   $\int_{-\infty}^{\infty}[e^{-(t-\tau)}u(t-\tau)][x(\tau) * \delta(\tau-5)]d\tau = x(t) * \delta(t-5) * (e^{-t}u(t)) =$
   $x(t) * (e^{-(t-5)}u(t-5))$, so $h(t) = e^{-(t-5)}u(t-5)$

4. (a). $x[n] = \delta[n-2], y = x[n] * h[n] = \left(\frac{1}{5}\right)^{n-2} u[n-2]$



(b). $x[n] = u[n-3], y = x[n] * h[n] = \frac{1-\left(\frac{1}{5}\right)^{n-2}}{1-\frac{1}{5}} u[n-3]$ –from example 2.3




5. $h(t) = h_1(t) + h_4(t) * \left(h_2(t) + h_3(t)\right) = \frac{1}{2}\delta(t-1) - \frac{1}{2}u(t-1) +$

$\left(\frac{1}{2}\delta(t) - \frac{1}{4}\delta(t-1)\right) * \left(2\delta(t) - 2u(t)\right) = \delta(t) - u(t)$