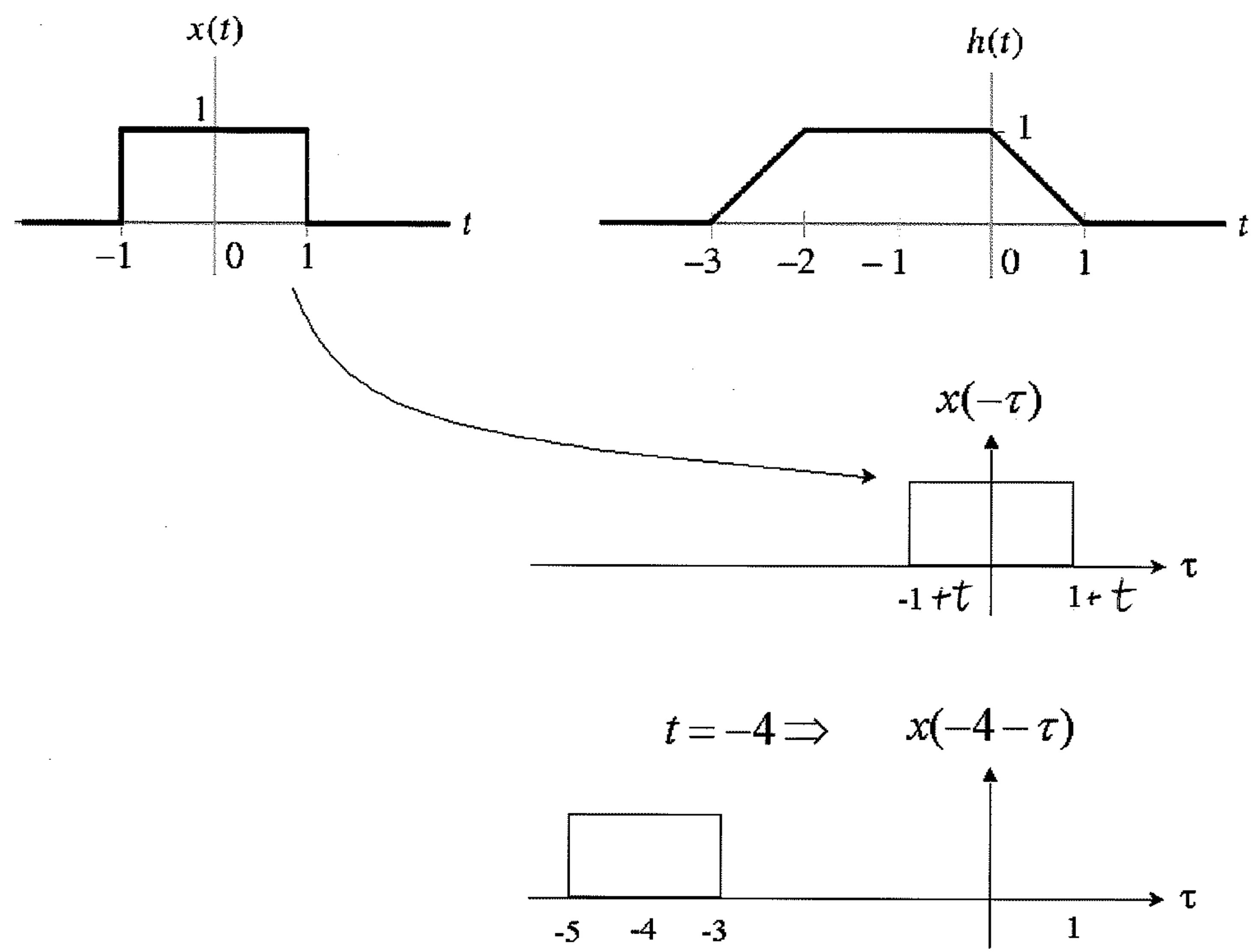
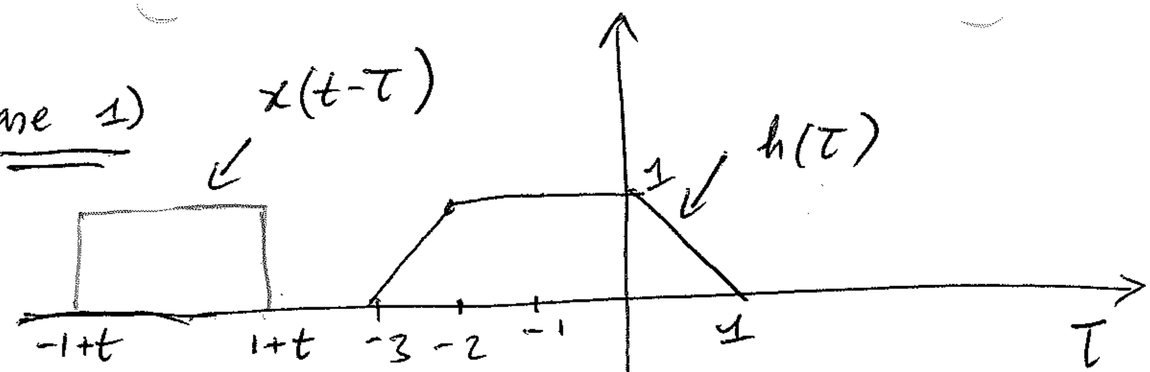
Convolution integral evaluation procedure (cont.)

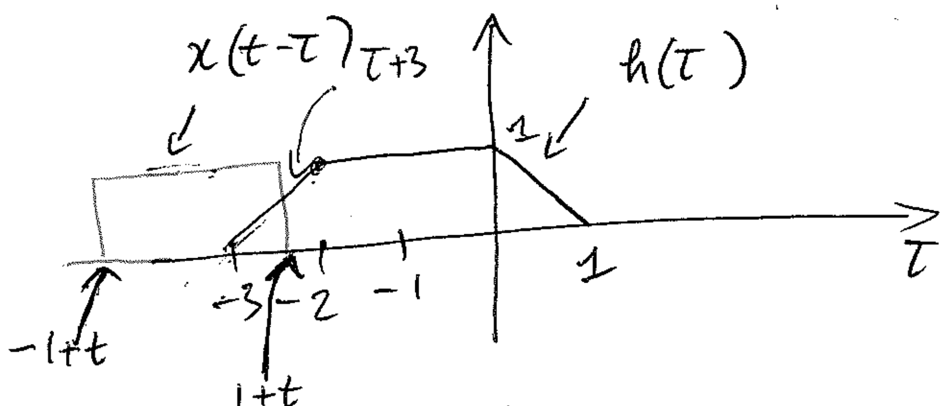


case 1)



$1+t \leq -3 \Rightarrow t < -4$, $y(t) = \int_{-\infty}^{\infty} x(t-\tau)\,h(\tau)\,d\tau = 0$

case 2)

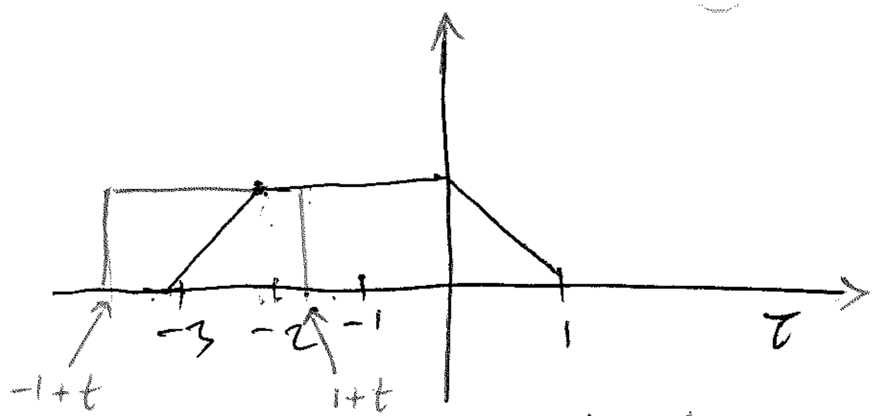


$-3 \leq 1+t \leq -2 \Rightarrow -4 \leq t \leq -3$

$$y(t) = \int_{-\infty}^{\infty} x(t-\tau)h(\tau)d\tau = \int_{-3}^{1+t} (1)(\tau+3)\,d\tau = \left(\frac{\tau^2}{2} + 3\tau\right)\Big|_{-3}^{1+t}$$

$$= \frac{(1+t)^2}{2} + 3(1+t) - \frac{9}{2} + 9$$

case 3)



$-2 \le 1+t \le -1 \Rightarrow -3 \le t \le -2$

$$y(t) = \int_{-\infty}^{\infty} x(t-\tau)\,h(\tau)\,d\tau = \int_{-3}^{-2} (1)(\tau+3)\,d\tau + \int_{-2}^{1+t} (1)(1)\,d\tau$$

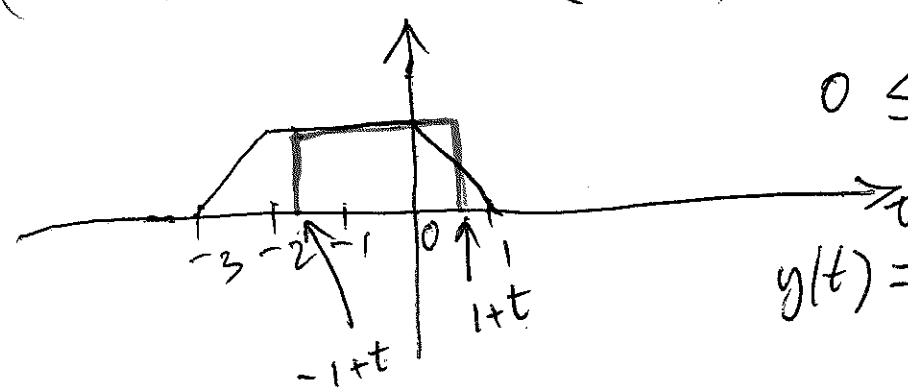
$$= \left(\frac{\tau^2}{2} + 3\tau\right)\Big|_{-3}^{-2} + \tau\Big|_{-2}^{1+t}$$

$$= \left(\frac{4}{2} - 6\right) - \left[\frac{9}{2} - 9\right] + (1+t) + 2$$

$\boxed{\text{See case 4 first}}$

(next page)

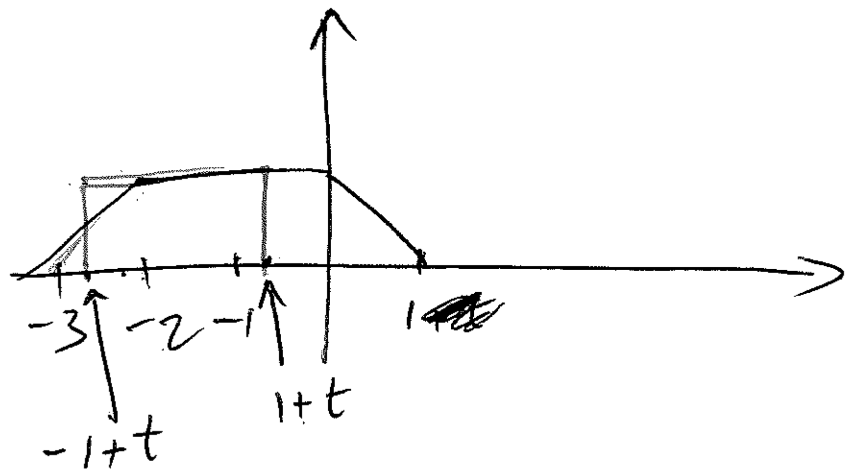
case 5)



$0 \le 1+t \le 1 \Rightarrow -1 \le t \le 0$

$$y(t) = \int_{-1+t}^{0} (1)\,d\tau + \int_{0}^{1+t} (1)(-\tau+1)\,d\tau$$

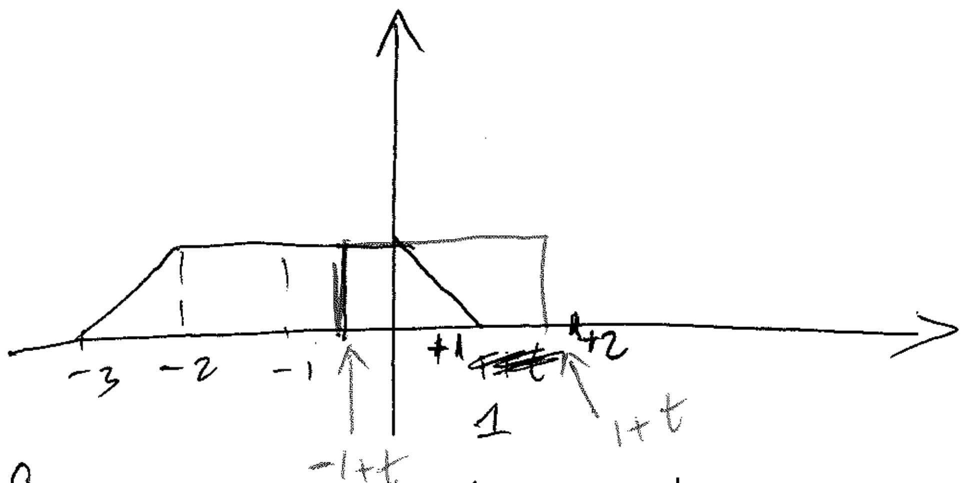
case 4:



$-1 \leq 1+t \leq 0 \Rightarrow -2 \leq t \leq -1$

$$y(t) = \int_{-\infty}^{\infty} x(t-\tau)\, h(\tau)\, d\tau = \int_{-1+t}^{-2} (\tau+3)\, d\tau + \int_{-2}^{1+t} (1)(1)\, d\tau$$

case 6:



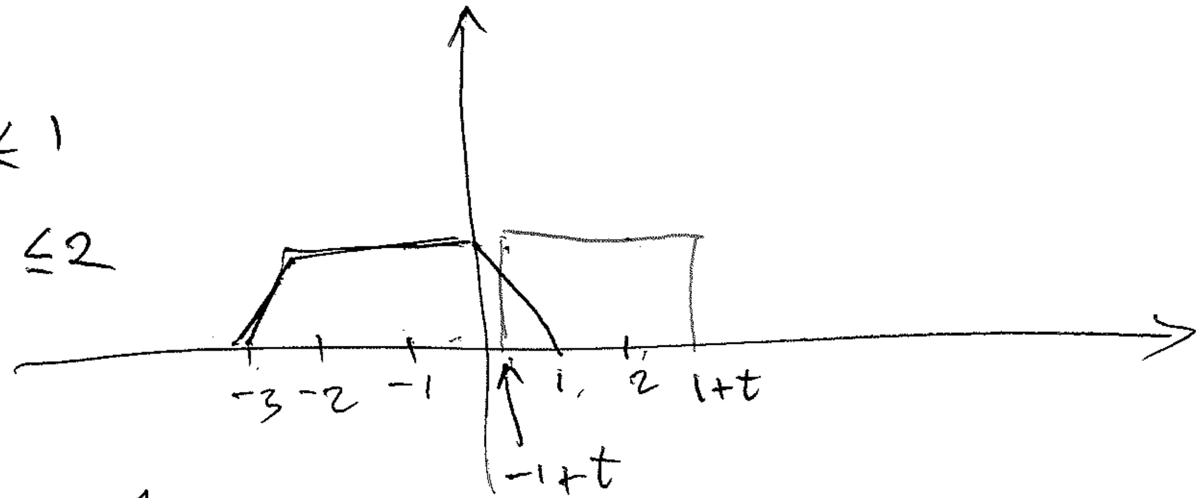
$$y(t) = \int_{-1+t}^{0} (1)\, d\tau + \int_{0}^{1} (-\tau+1)\, d\tau$$

(5)

case 7:

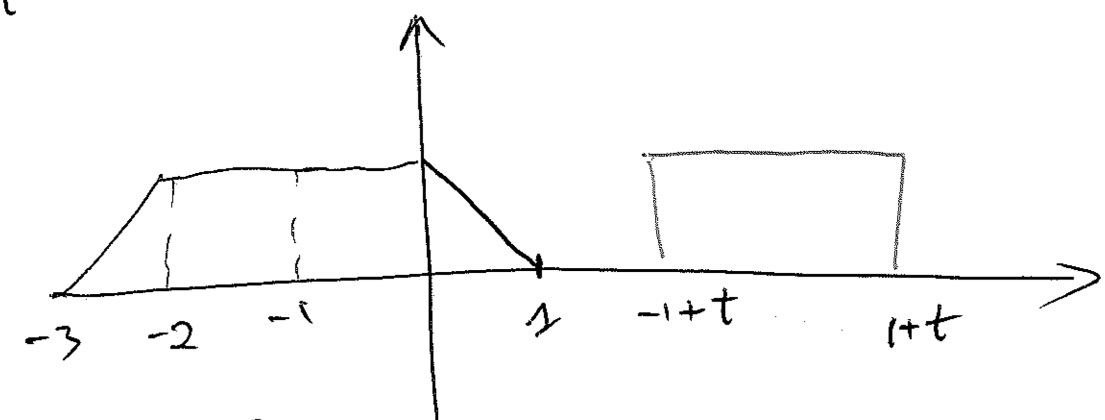
$0 \leq -1+t \leq 1$

$\Rightarrow \quad 1 \leq t \leq 2$



$$y(t) = \int_{-1+t}^{1} (-\tau+1)\,d\tau$$

case 8:



$y(t) = 0$