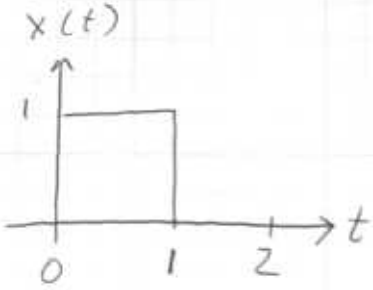
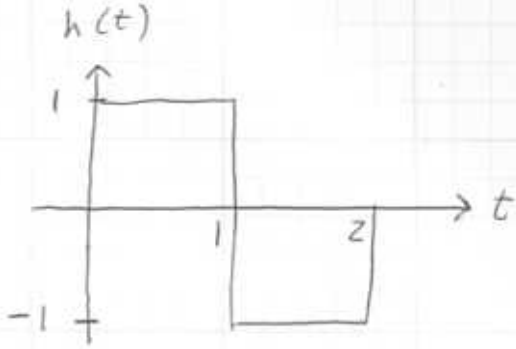
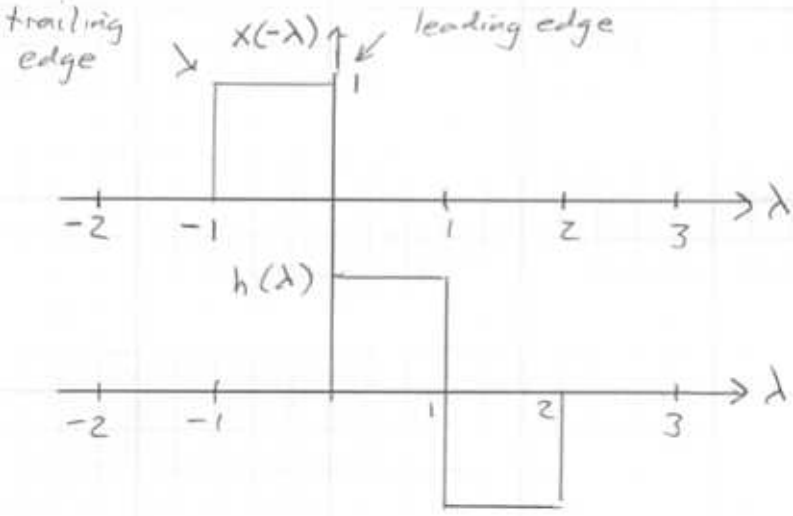
15.44a



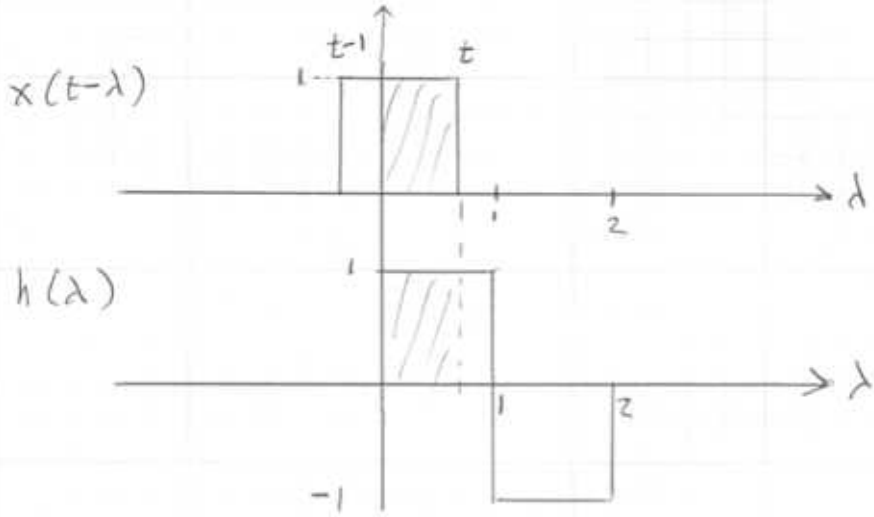


Choose one to Flip: x(t) appears "easier"



This is the <u>t=0 position</u>, so the leading edge is t (since at $t=0$ this occurs at $\lambda=0$) and the trailing edge is $t-1$ (since at $t=0$, this makes this value $\lambda=0-1=-1$). The amount you slide $x(-\lambda)$ creates $x(t-\lambda)$ where t is the amount of the slide

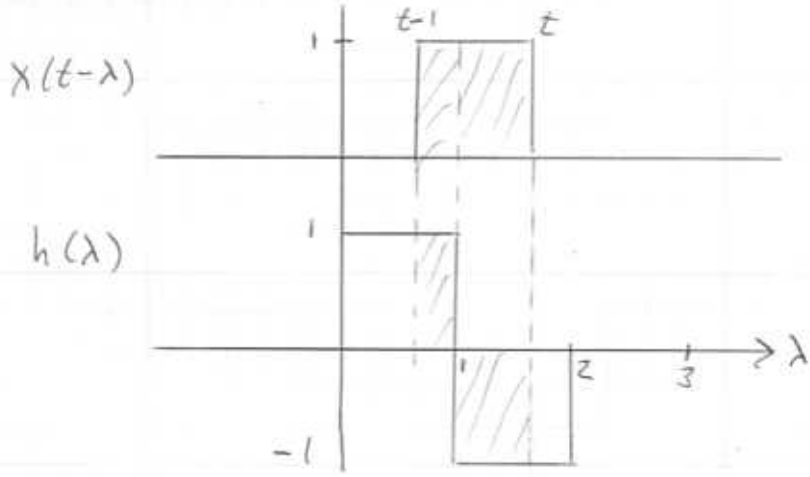
Intersection region 1 $\quad 0 < t < 1$



Overlap occurs from $\lambda = t$ to $\lambda = 0$

$$y_1(t) = \int_0^t h(\lambda)\, x(t-\lambda)\, d\lambda = \int_0^t (1)(1)\, d\lambda = \lambda \Big|_0^t = t$$

Intersection Region 2 $\quad 1 < t < 2$



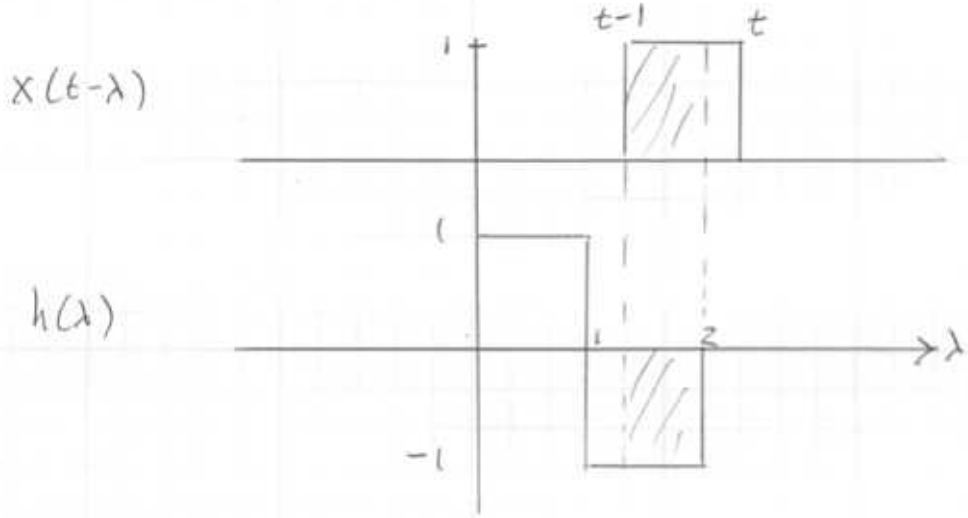
Two overlap areas from $\lambda = t$ to $\lambda = 1$ for rightmost and from $\lambda = t-1$ to $\lambda = 1$ for part on left

$$y_2(t) = \int_{t-1}^{1} (1)(1)\, d\lambda + \int_1^t (1)(-1)\, d\lambda$$

$$y_2(t) = \lambda \Big|_{t-1}^{1} + -\lambda \Big|_{1}^{t}$$

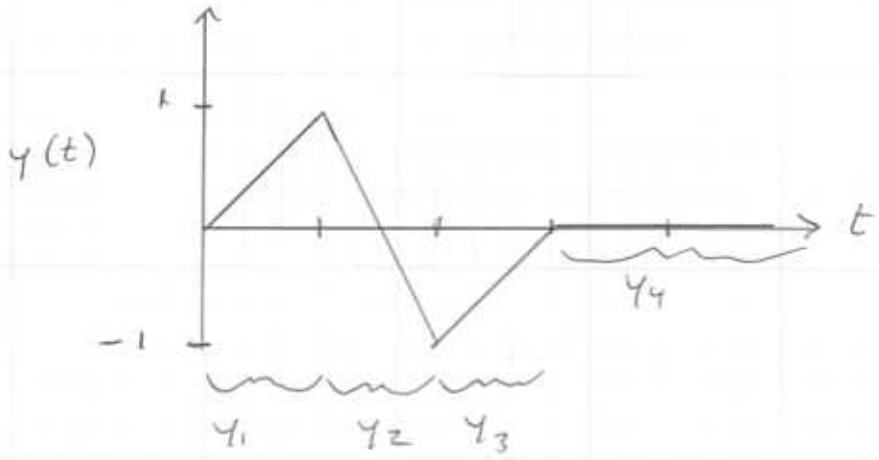
$$y_2(t) = 1 - (t-1) + (-t) - (-1) = 3 - 2t$$

<u>Intersection Region 3</u> $\quad 2 < t < 3$



Overlap from $\lambda = 2$ to $\lambda = t-1$

$$y_3(t) = \int_{t-1}^{2} (1)(-1)\, d\lambda = -\lambda \Big|_{t-1}^{2} = -\left[2 - (t-1)\right]$$

$$y_3(t) = t - 3$$

For $t > 3$ no overlap so $y_4(t) = 0$