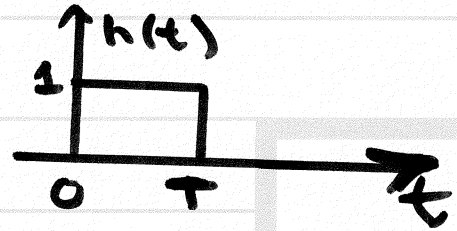
Some notes re: the Solution to Exam 1 from Fall 2011

- $y_2(t) = \int_{t-7}^{t-4} x(\tau)\, d\tau$ What is impulse response $h_2(t) = ?$

- We know from class that for

$$y(t) = \int_{t-T}^{t} x(\tau)\, d\tau \Rightarrow h(t) = u(t) - u(t-T)$$



- So, consider $T = 3$:

$$y(t) = \int_{t-3}^{t} x(\tau)\, d\tau \Rightarrow y_2(t) = y(t-4)$$
$$= y(t) * \delta(t-4)$$

- Thus: $h_2(t) = u(t-4) - u(t-7)$

- More generally: $y(t) = \int_{t-T_2}^{t-T_1} x(\tau)\, d\tau$

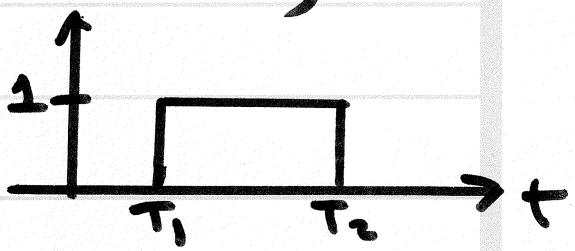
where $T_2 > T_1$

$$h(t) = \int_{t-T_2}^{t-T_1} \delta(\tau)\, d\tau = \begin{cases} 1, & \text{when } t-T_1 > 0 \text{ and } t-T_2 < 0 \\ 0, & \text{otherwise} \end{cases}$$

$t - T_1 > 0 \Rightarrow t > T_1$ $\qquad$ $t - T_2 < 0 \Rightarrow t < T_2$

combining: $h(t) = 1$ for $T_1 < t < T_2$

$= u(t-T_1) - u(t-T_2)$



- This result holds even $T_1 < 0$ (T_1 negative)
  $\Rightarrow$ just require $T_2 > T_1$