Computation of convolution integral

Lets go straight to the recommended approach.

$$y(t) = \int x(\tau)h(t-\tau)\,d\tau$$

- Calculate output at time t_0 due to inputs at all times τ
- Redo this for the next value of t.

Here are the basic steps for one value of t, say t_0.

a) Form $W_{t_0}(\tau) = x(\tau)h(t_0-\tau)$ for all τ.

b) $$y(t_0) = \int W_{t_0}(\tau)\,d\tau$$

Then repeat for more values of t.

- Again, the advantage of this method is that for many signals and systems, the functional form of $W_t(\tau)$ remains the same for values of t in an interval.

Therefore we expect to write an answer of the form.

$$y\ t) = \begin{cases} f_0\ t) & t \leq t_0 \\ f_1(t) & t_0 < t \leq t \\ & \\ f_{m-1}\ t) & t_{m-1} < t \leq t_m \\ f_m\ (t) & t > t_m \end{cases}$$

where each $f_i\ t)$'s of the form

$$f\ t)\quad \int w_t(\tau)d\tau$$

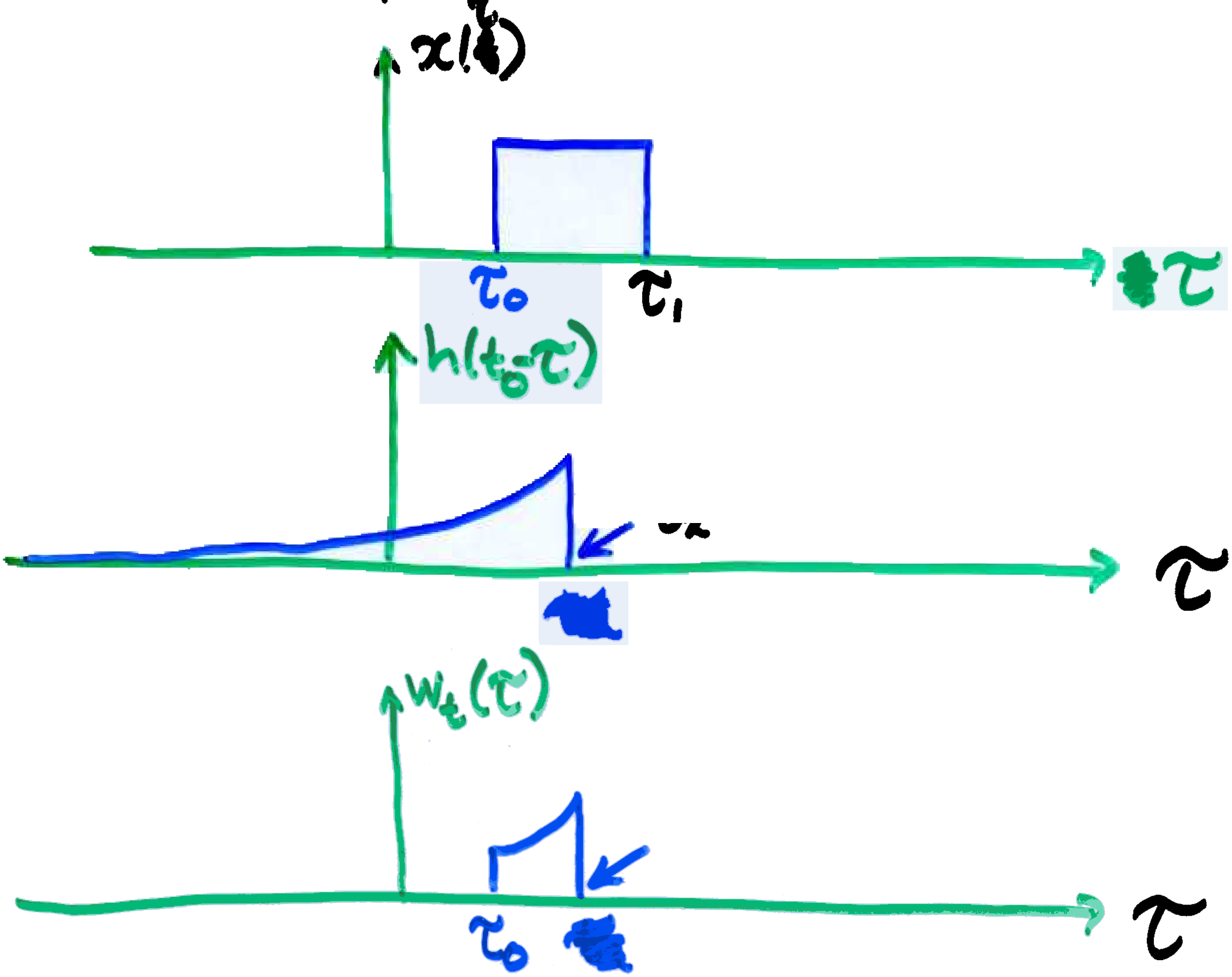
and over each range the functiona form of $w_t(\tau)$ is the same

Again $W_t(\tau)$ can be computed in a convenient graphical manner

$$W_t(\tau) = x(\tau)h(t-\tau)$$

Just plot them + multiply

For example



Now $y(t_0) = \int w_t(\tau)\,d\tau$

One tricky thing here is the formation of $h(t_0-\tau)$.

Lets define $\tilde{u}(\tau) = h(-\tau)$ (reflection

what is $\tilde{u}(\tau\ t_0)$ (shift to right by

$$\tilde{u}(\tau-t_0) = h(-(\tau-t_0)) = h(t_0-\tau)$$