TUT2 problem number ?

Explaination for value at $t = 0$

We have $\tau_c \dfrac{dh(t)}{dt} + h(t) = \delta(t)$

or $\tau_c \dfrac{dy(t)}{dt} + y(t) = \delta(t)$ where $y(t) = h(t)$.

Integrate both sides with limit 0^- to 0^+

$$\tau_c \int_{0^-}^{0^+} \frac{dy(t)}{dt}\,dt + \int_{0^-}^{0^+} y(t)\,dt = 1$$

$$\tau_c \left[y(0^+) - y(0^-) \right] + 0 = 1$$

$\Rightarrow y(t) = 0 \leftarrow 0^- \text{ to } 0^+$

We have taken $\int_{0^-}^{0^+} y(t)\,dt = 0 \rightarrow$ Reason?

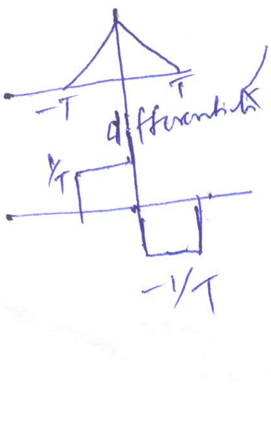
if $\int_{0^-}^{0^+} y(t)\,dt \neq 0$, $y(t)$ has to be an impulse f^n.

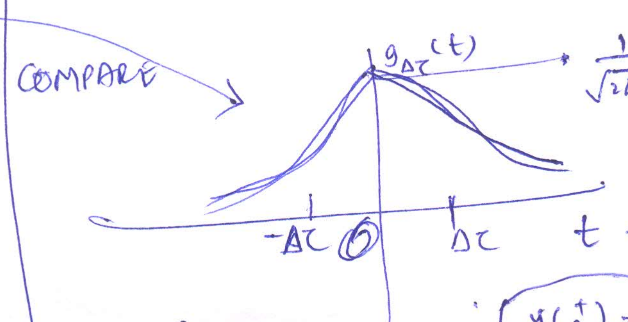
[Now an impulse f^n can be also be written as limit of Gaussian pulse i.e. (following shape pulse?

since the students do not know about Gaussian f^n!!) !!

$$\delta(t) = \lim_{\Delta\tau \to 0} g_{\Delta\tau}(t)$$

$$g_{\Delta\tau}(t) = \frac{1}{\sqrt{2\pi}\,\Delta\tau} e^{-\frac{1}{2}\frac{t^2}{(\Delta\tau)^2}}$$





So if $y(t)$ is an impulse then $y'(t)$ should be

indicating zero area

$\therefore \tau_c \left[y(0^+) - y(0^-) \right] = 1$ But $y(0^-) = 0$ since no impulse applied at $t = 0^-$

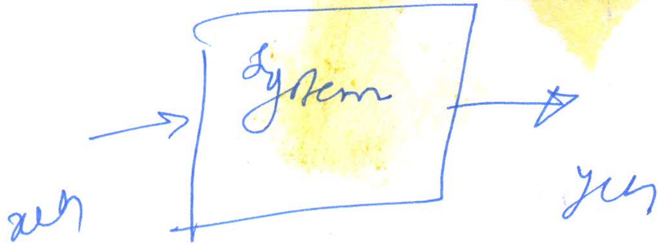
$\therefore y(0^+) = \frac{1}{\tau_c} h(0^+)$

~~Hence y(t) dt~~

But we must have $\tau_c(\;\downarrow\;) + y(t) = \delta(t)$ → impulse

This is not possible

+ve & −ve   +ve   +ve



System linear or nonlinear ?

$$\frac{dy(t)}{dt} + a \cdot y(t) = b \cdot x(t)$$

constant coefficient