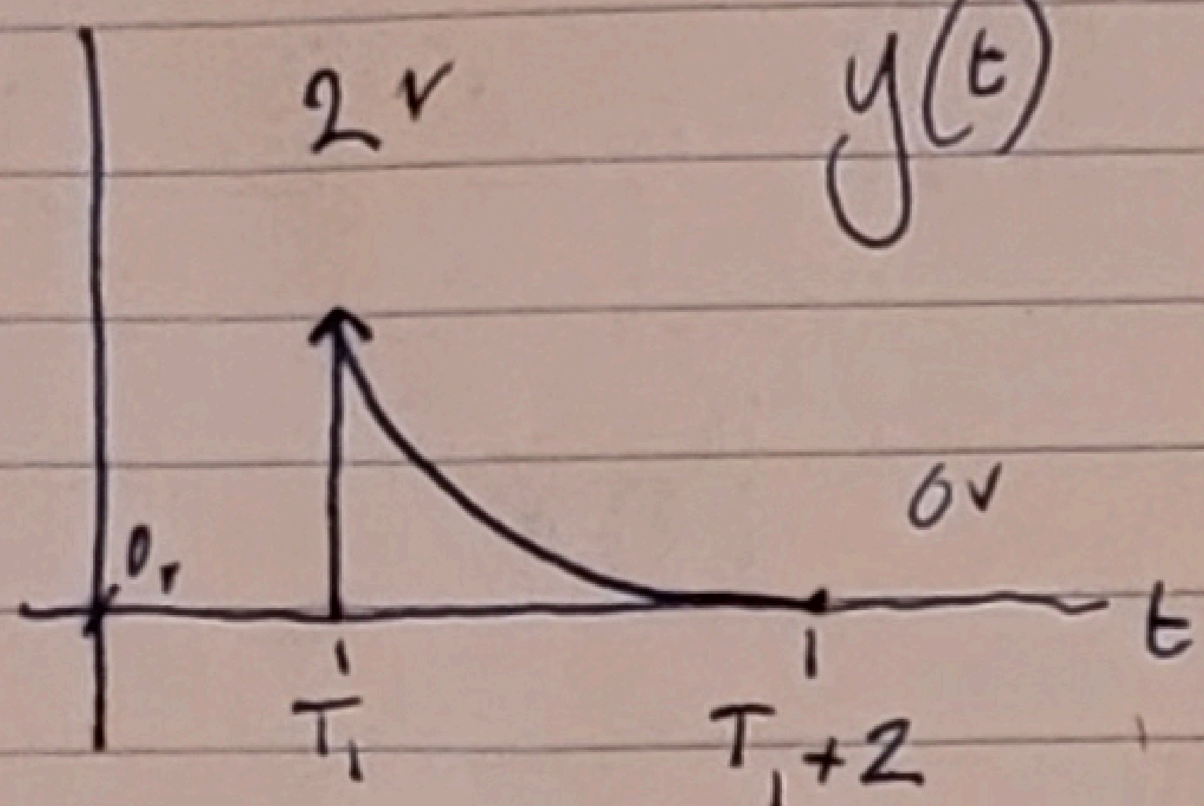
ELEC2040

Assumptions:

Capacitor $V_0 = 2V$

capacitor discharges at $V = 2e^{t * \tau}$



Assumed source of 2V DC

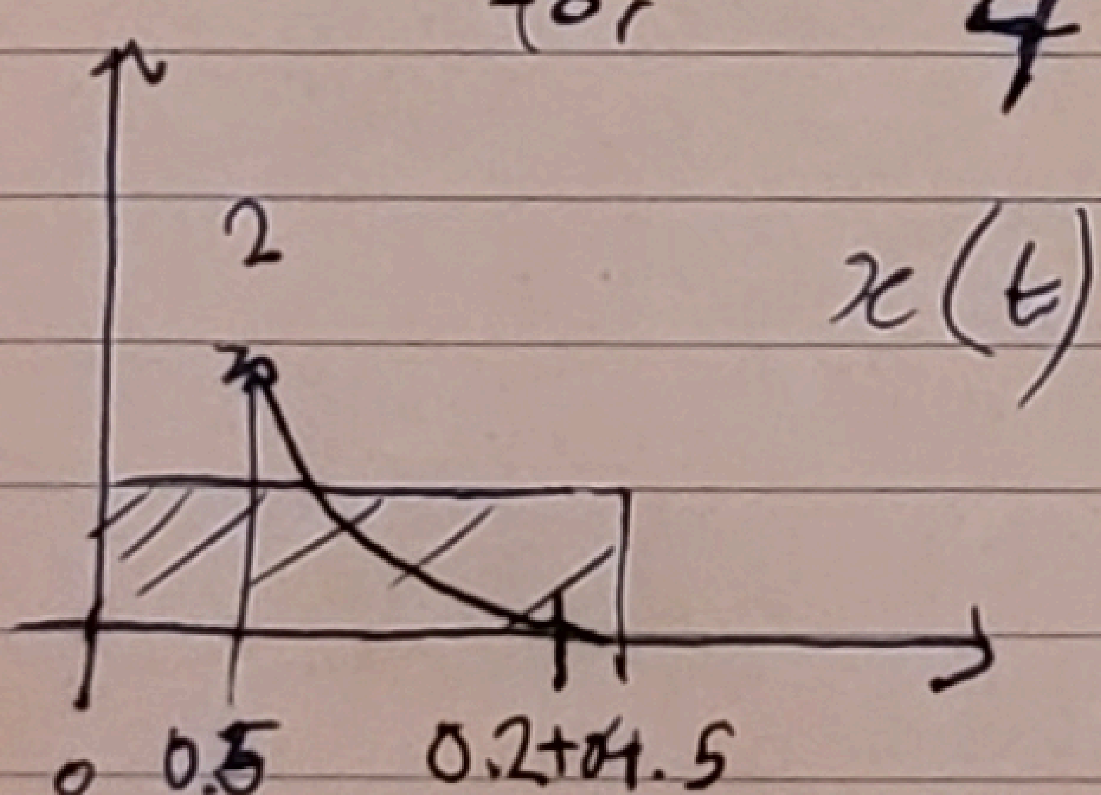
Assumed Impulse Happens when runner steps on mat

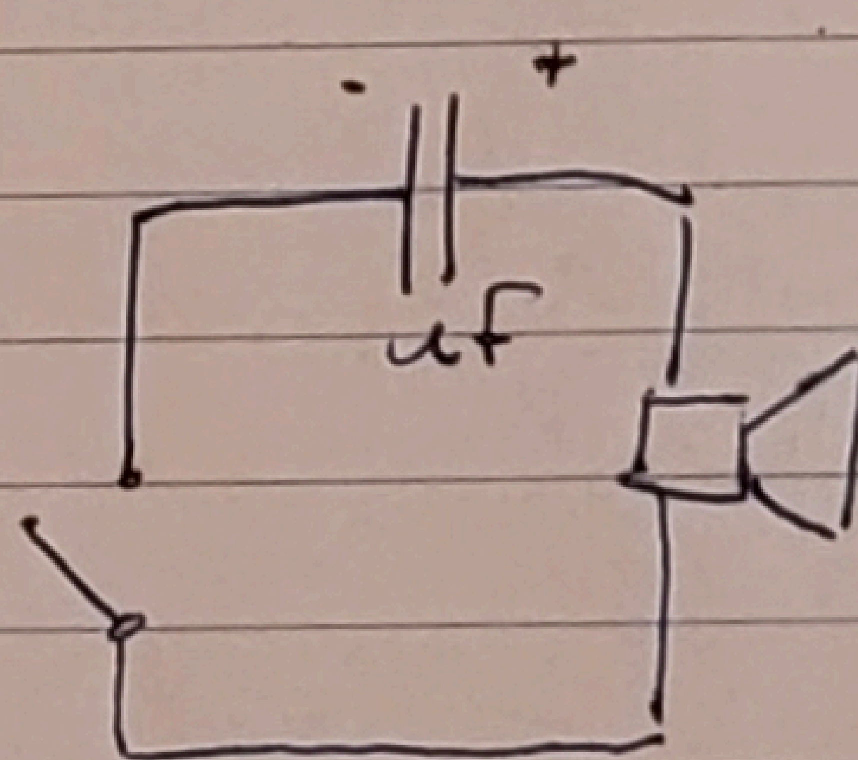
Runner steps on mat at time 0 for 4 seconds before stepping off.

0.5 delay before Charging (constant)
Charging t is negligable (constant)
Discharging t is 2 sec (constant)

Someone stepping onto the mat will be considered as a impulse $2\delta(t)$

standing on the pressure pad for 4 seconds





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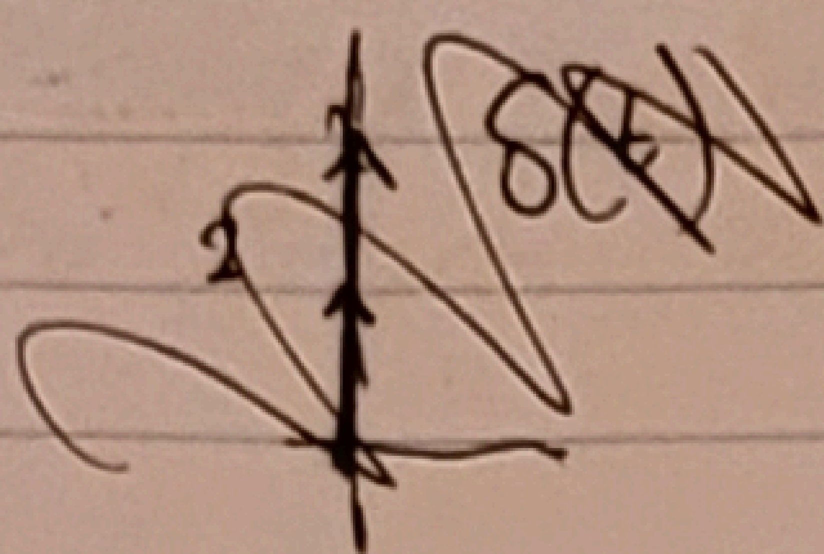
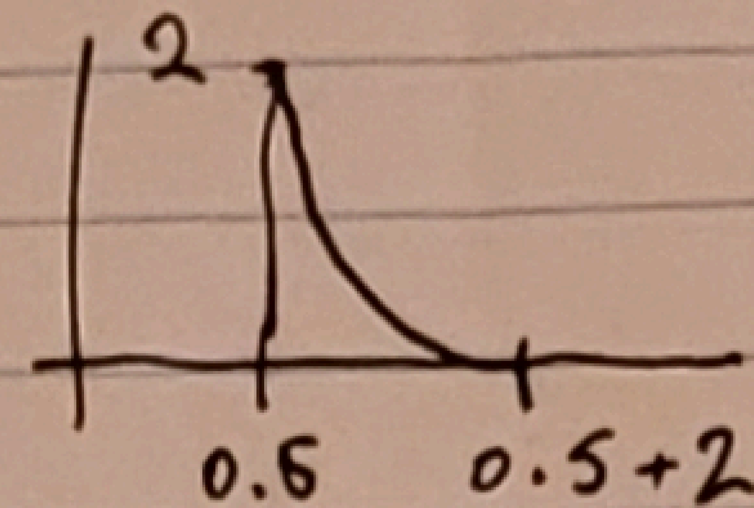
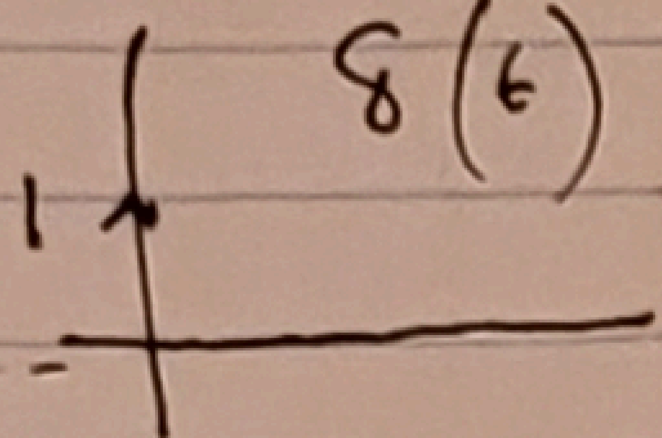
for $\delta(t)$ (someone stepping on and stepping off)

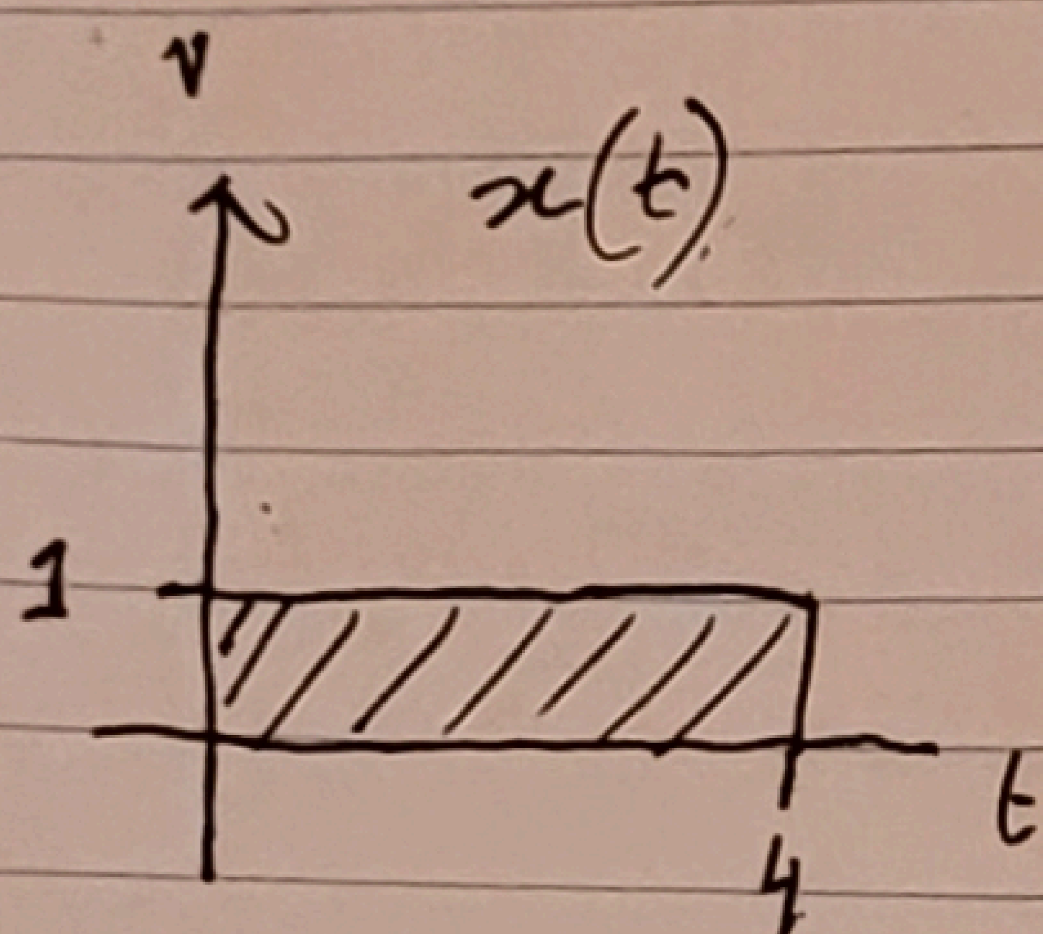




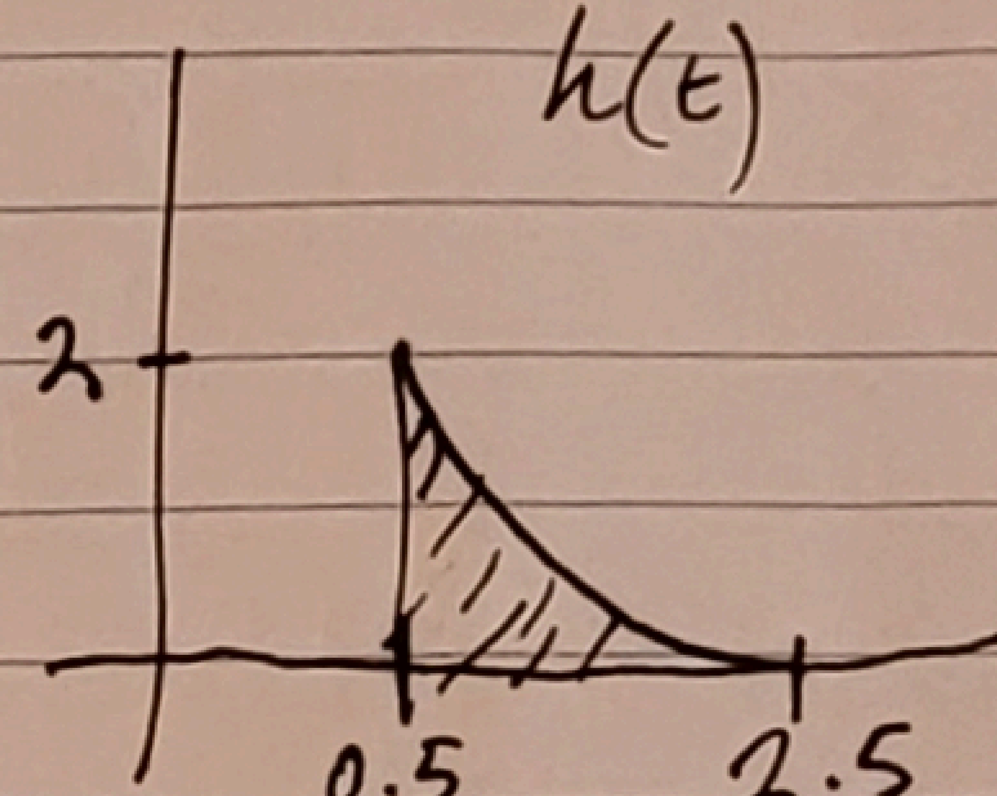


for $u(t) = \begin{cases} 0 & t<0 \\ 1 & t \geq 0 \\ 0 & t \geq 4 \end{cases}$ (someone stepping on for 4 sec and off)

convolved



$*$



$$\int_{-\infty}^{\infty} x(\tau)\, h(t-\tau)\, d\tau$$

$$h(t) = 2\exp(-(t-0.5))\, u(t-0.5)$$

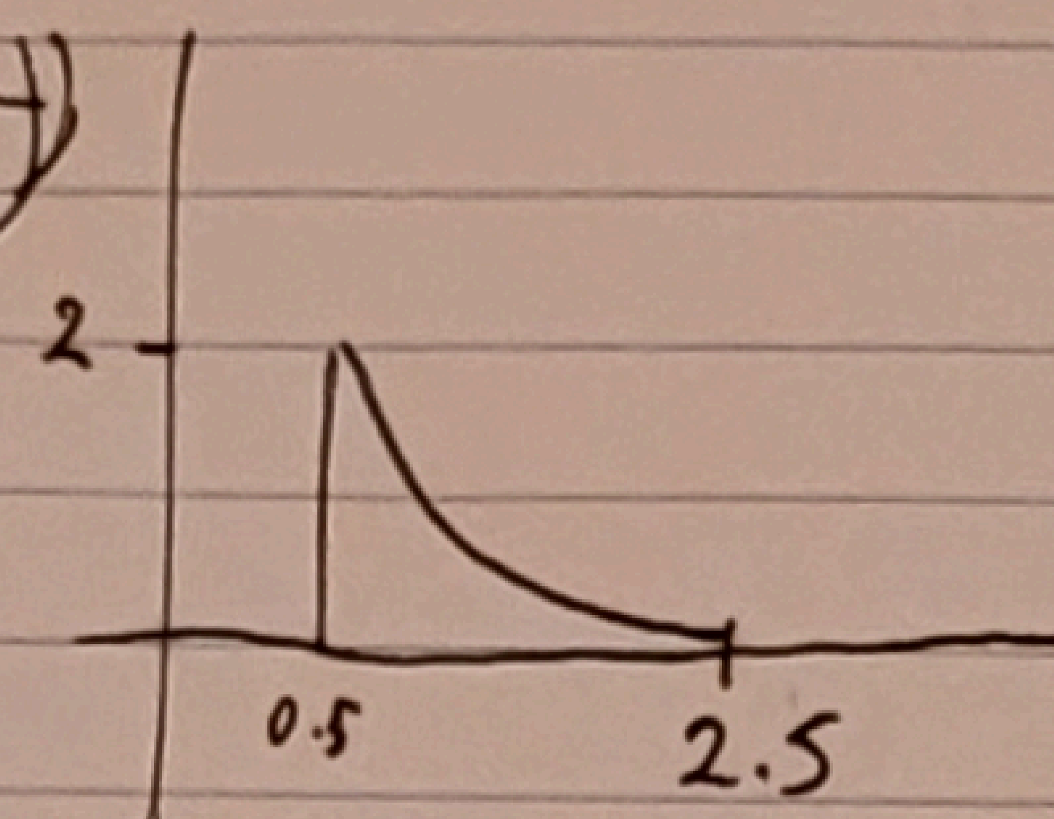
find $h(t-\tau)$

$$= 2\exp(-((t-\tau)-0.5))\, u((t-\tau)-0.5)$$

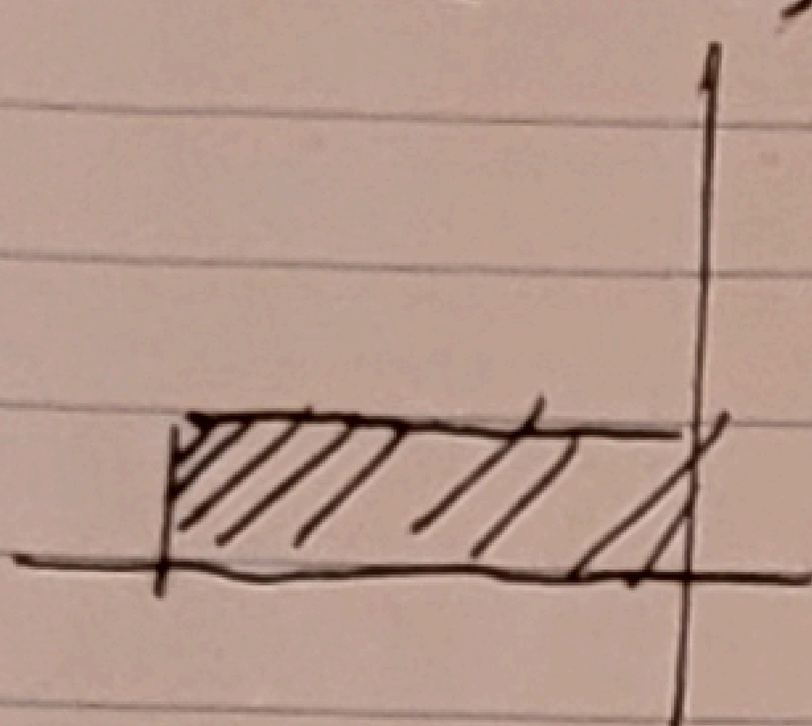
$\int_{-\infty}^{\infty} x(t)\, h(t-\tau)$

~~$\int_{-\infty}^{\infty} x(t)\, 2\exp(-((t-\tau)-0.5))\, u((t-\tau)-0.5)$~~

~~Easy~~ Easier to find $x((t-\tau))$



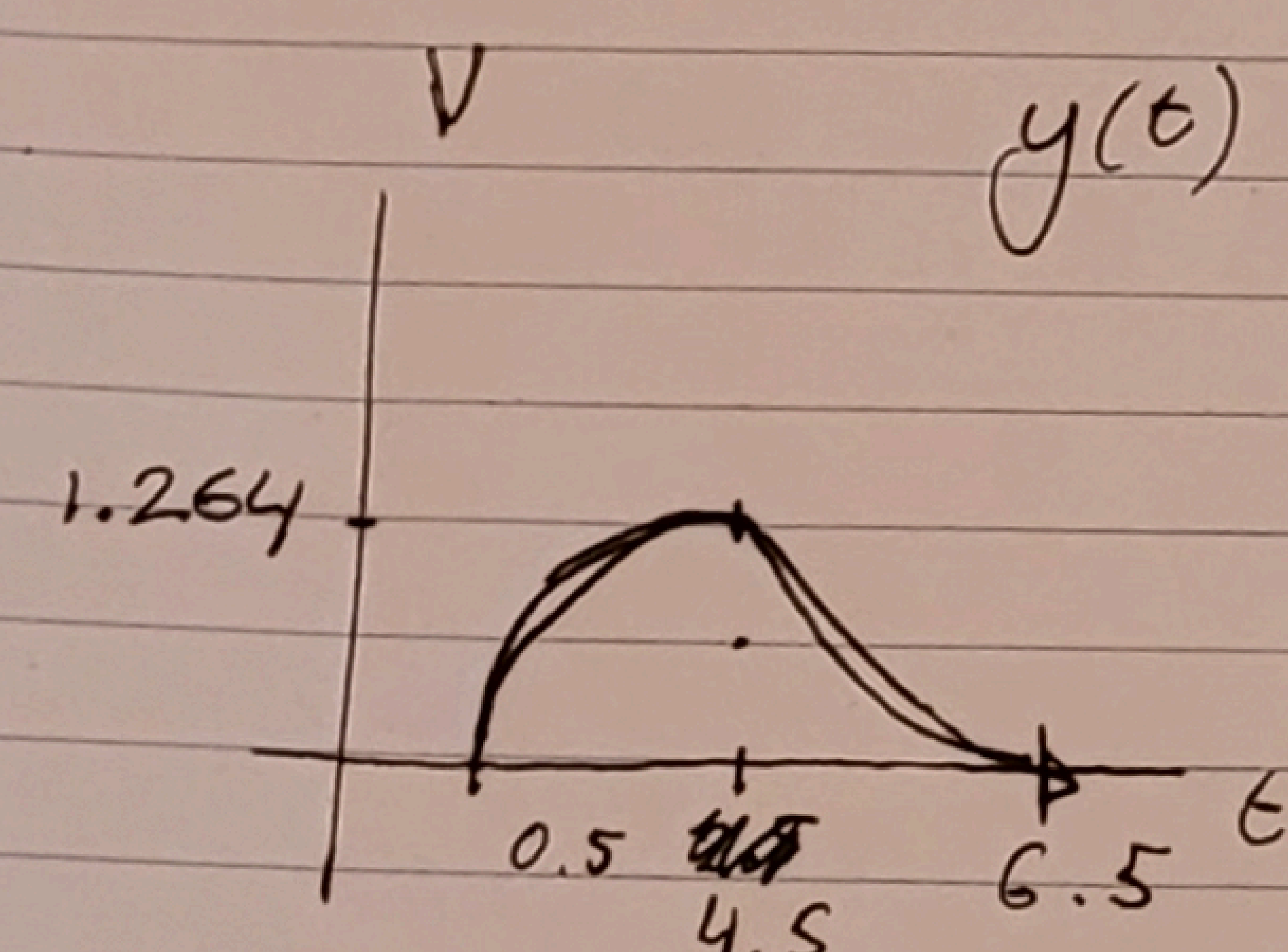
$= x(-(t-\tau))$



As per example in slides

~~for $0 < \tau < 0.5$~~

~~for $0.5 < \tau < 1.5$~~



As the impulse approaches 0.5 sec delay signal $y(t)$ increases to a point (1.264V) before beggining to discharge exponentially again.