Mohammed Jamil Saada
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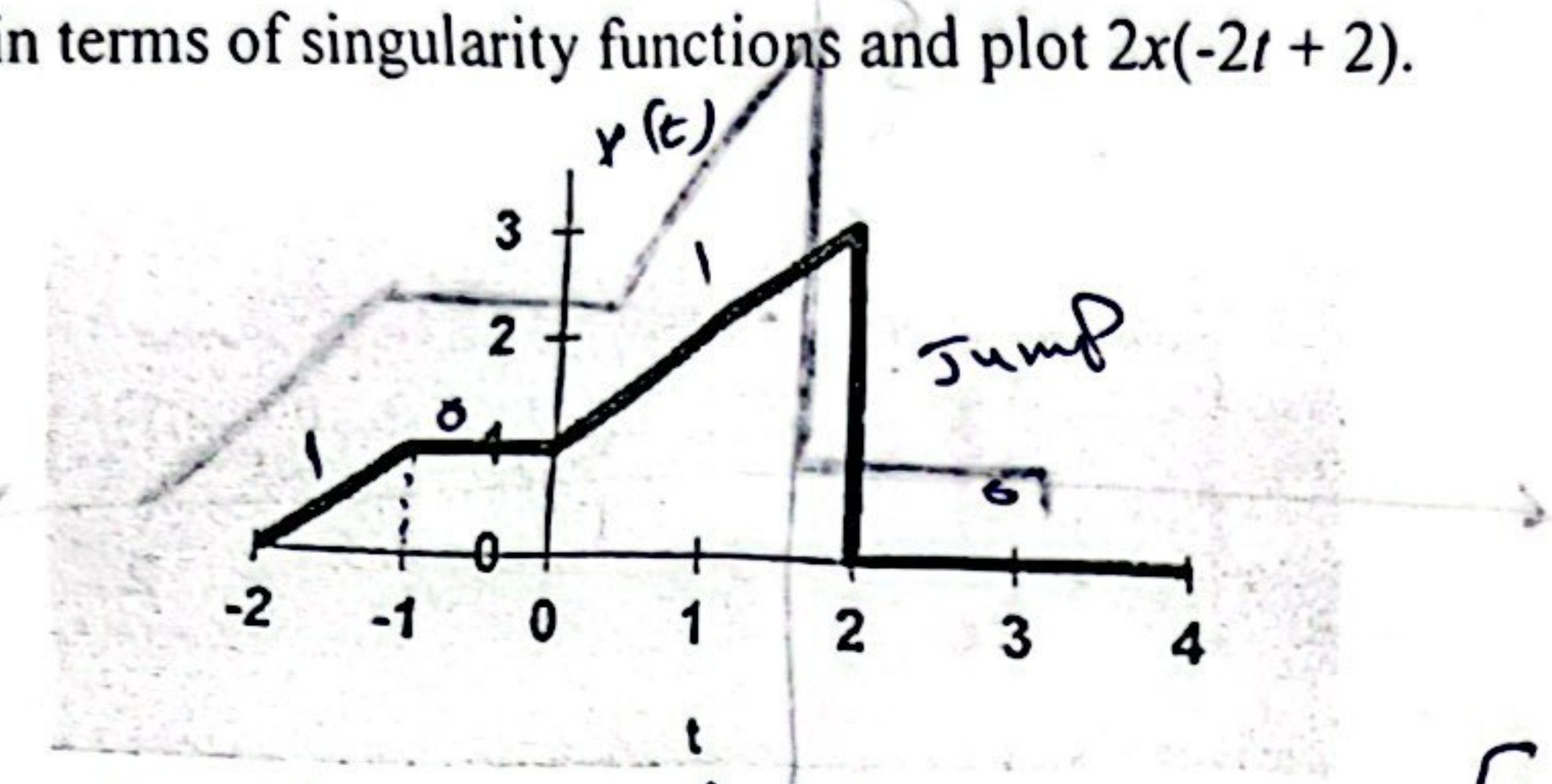
Birzeit University - Faculty of Engineering and Technology
Electrical and Computer Engineering Department
EE2312-Signals and Systems

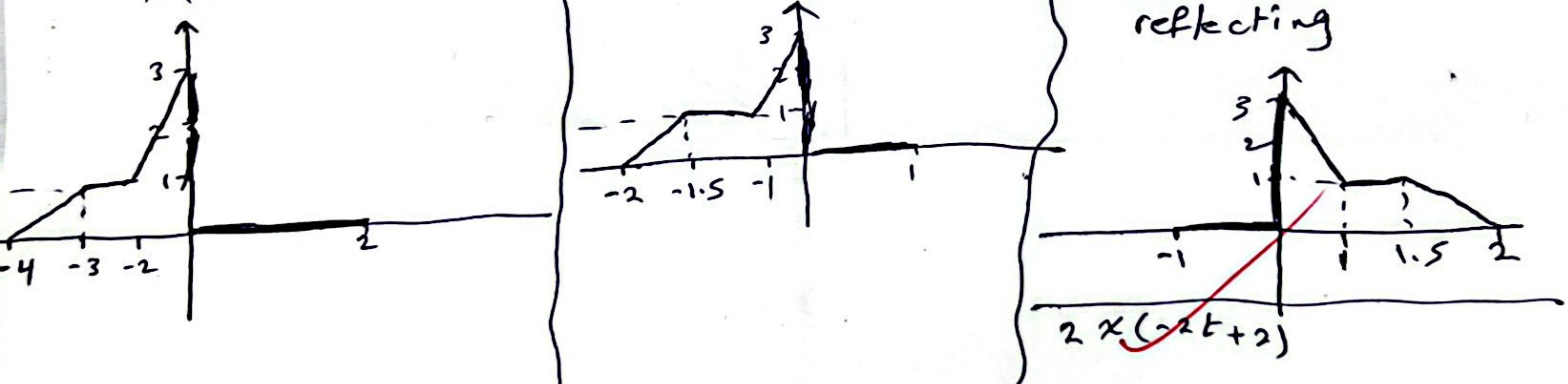
Inst.: Dr Mahran Quraan **Quiz 1** **Summer sem. 2023-24**

1. Express the signal in terms of singularity functions and plot $2x(-2t+2)$.



$x(t) = r(t+2) + (0-1)\,r(t+1) + (1-0)\,r(t) + \left[(0-3)\,u(t-2) + (0-1)\,r(t-2)\right]$

$\boxed{= r(t+2) - r(t+1) + r(t) - 3u(t-2) - r(t-2)}$



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2. Compute the integral $\int_{-10}^{10} e^{-t}\sin(\pi t)\,\dot{\delta}(t-2)\,dt$.

$\boxed{t_0 = 2}$

$\int_{-10}^{10} \underbrace{e^{-t}\sin(\pi t)}_{x(t)}\,\dot{\delta}(t-2)\,dt = (-1)^1 \left.\frac{dx}{dt}\right|_{t=2} = (-1)(\pi e^{-2})$

$\boxed{= -\pi e^{-2}}$

$\frac{dx}{dt} = \pi e^{-t}\cos(\pi t) + {}^{-}\sin(\pi t)\,e^{-t}$

$= \pi e^{-t}\cos(\pi t) - \sin(\pi t)\,e^{-t}$

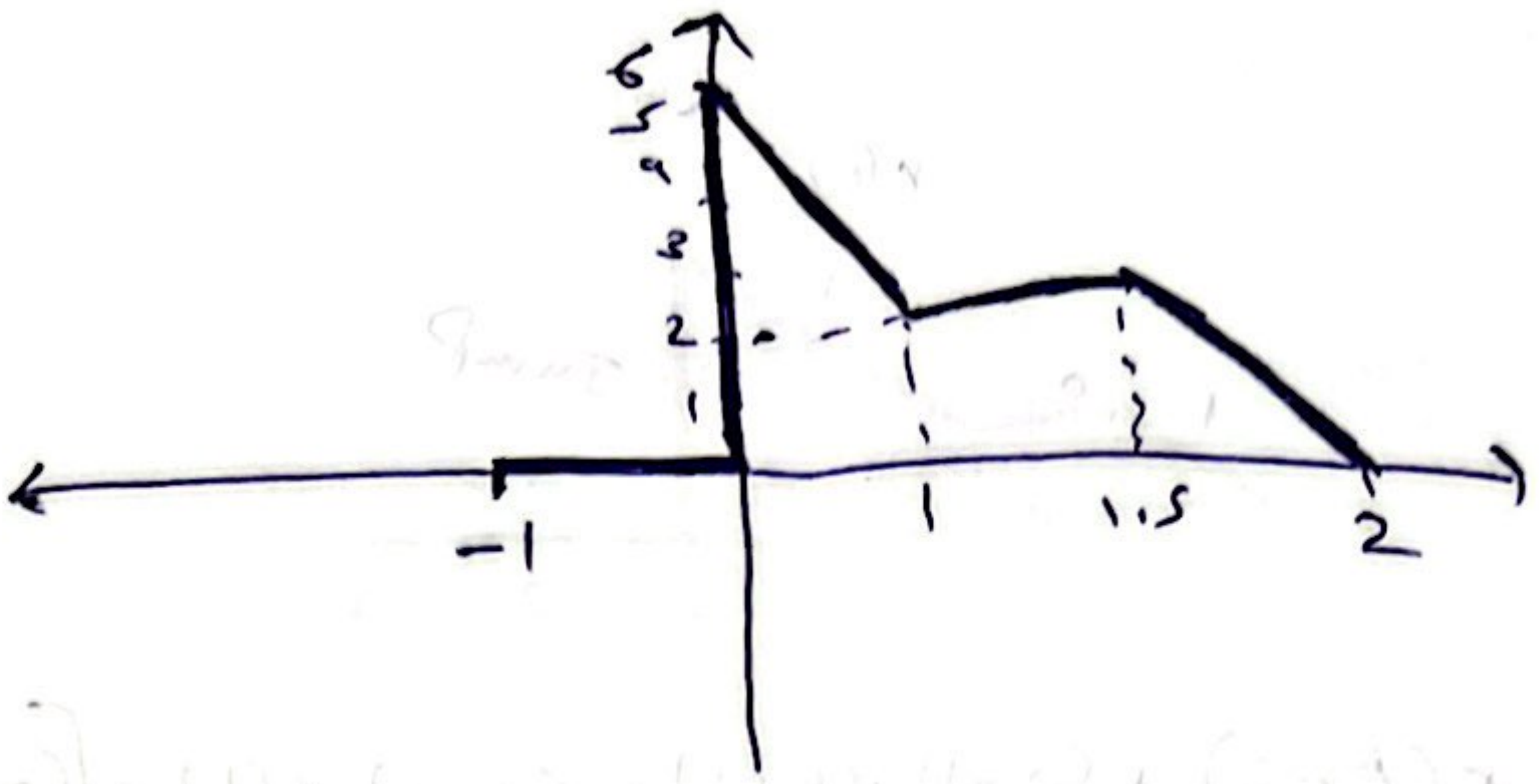
$\left.\frac{dx}{dt}\right|_{t=2} = \pi e^{-2}\cos(2\pi) - \sin(2\pi)\,e^{-2}$

$= \pi e^{-2}(1) - 0$

$= \pi e^{-2}$

$\cancel{2x(}$

$\cancel{2x(}$ $2x(-2t+2)$



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ENEE2312

Dr. Mahran Quraan

Quiz #2

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1) Determine whether the following signals is **linear or non-linear, causal or non-causal, time variant or time invariant**:

1. $y(t) = x(2t+2)$

2. $\frac{d^2 y(t)}{dt^2} + y(t) = x(t)$

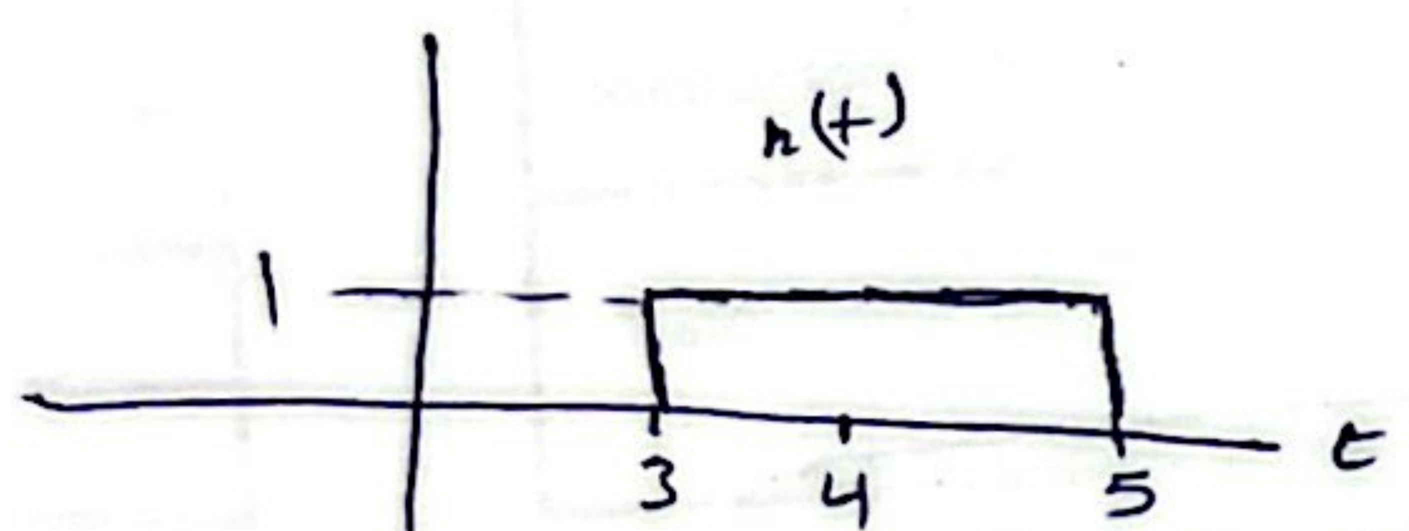
system	linear or non-linear	causal or non-causal	time variant or time invariant
1	linear	non-causal	time Variant TV
2	linear	causal	time invariant TIV

2) Consider a LTI system, which has the impulse response:

$$h(t) = \pi\left(\frac{1}{2}t - 2\right) = \pi\left[\tfrac{1}{2}[t-4]\right]$$

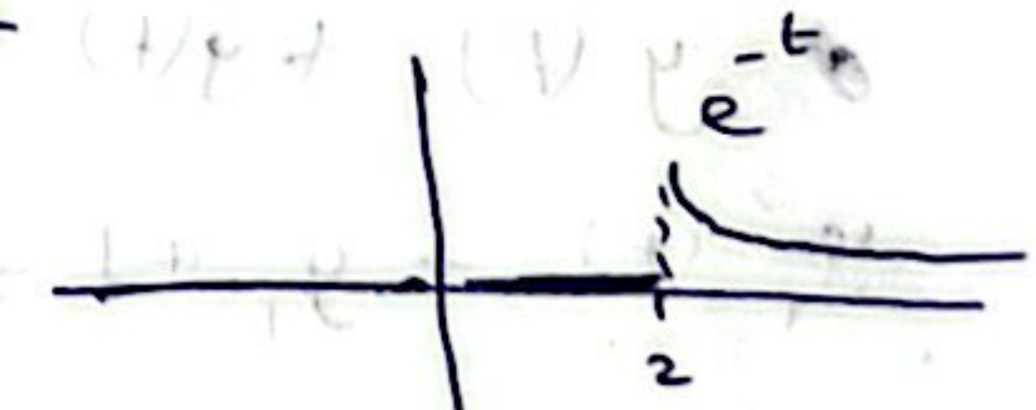
Using the convolution integral, find the system response, $y(t)$, when the input is

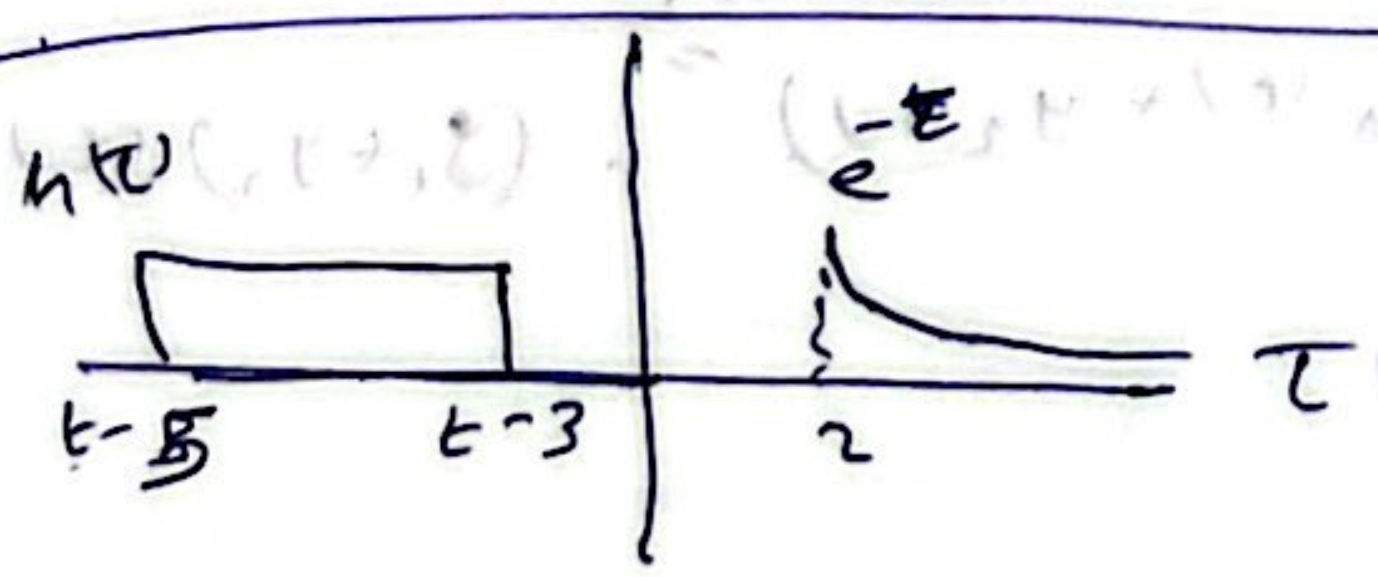
$$x(t) = e^{-t}u(t-2)$$



(3, 5)
(2, ∞) {(5, 7, ∞)

$\cancel{x(t)}$





$$y(t) = x(t) * h(t)$$

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

Case ①: $t-3 \le 2 \rightarrow t \le 5 \rightarrow y(t) = 0$

Case ②: $t-5 \le 2$ & $t-3 \ge 2 \rightarrow 5 \le t \le 7 \rightarrow y(t) = \int_2^{t-3} (1)\, e^{-\tau}\, d\tau$

$t \le 7$ $\quad t \ge 5$

$$= e^{-\tau}\Big|_{t-3}^{2}$$

$$y(t) = e^{-2} - e^{-(t-3)}$$

$$y(t) = e^{-2} - e^{3-t}$$

Case ③: $t-5 \ge 2 \rightarrow t \ge 7$

$$y(t) = \int_{t-5}^{t-3} e^{-\tau}\, d\tau = e^{-\tau}\Big|_{t-3}^{t-5}$$

$$= y(t) = e^{5-t} - e^{3-t}$$

$$\boxed{y(t) = \begin{cases} 0, & t \le 5 \\ e^{-2} - e^{3-t}, & 5 \le t \le 7 \\ e^{5-t} - e^{3-t} & t \ge 7 \end{cases}}$$