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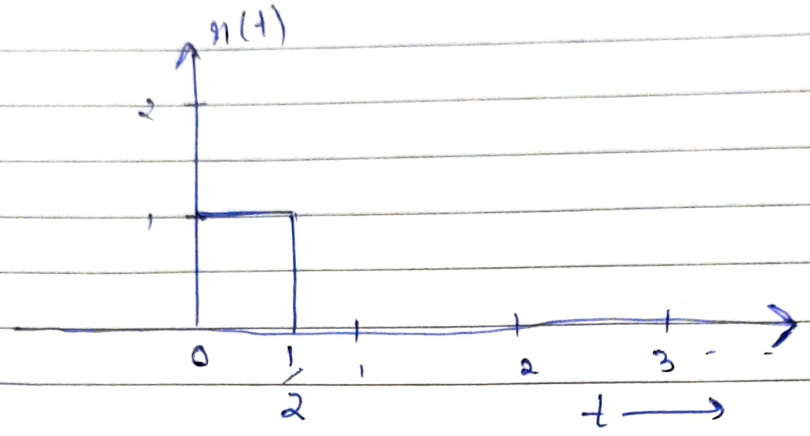
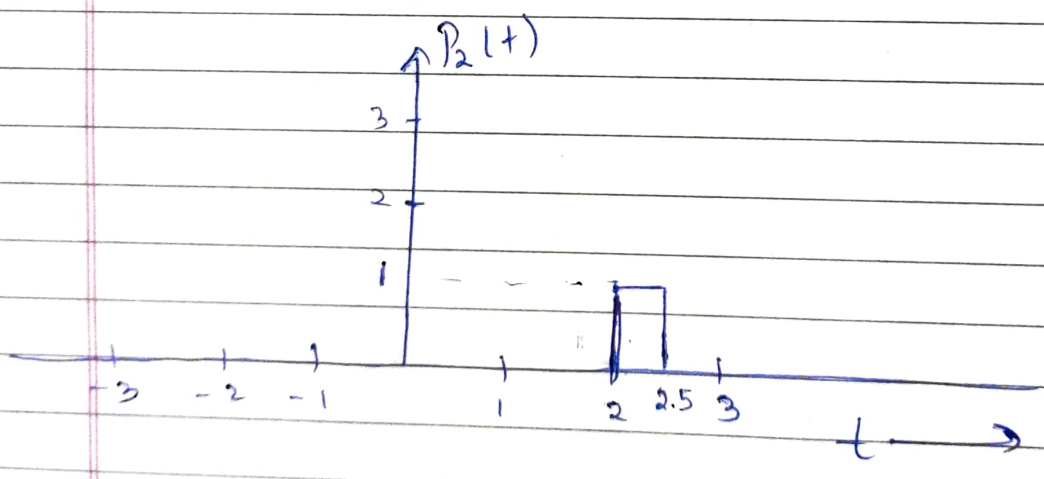
16.0 → $g_1(t) = \begin{cases} 1, & 0 \le t \le \frac{1}{2} \\ 0, & \text{otherwise} \end{cases}$



$P_\tau(t) = g_1(t-\tau)$ → Given

(a) → for $\tau = 2$ (Given)

$P_2(t) = \begin{cases} 1, & 2 \le t \le 2.5 \\ 0, & \text{otherwise} \end{cases}$



(b) → $x(t) = \cos^2(2\pi t)$

$y(\tau) = \langle x(t), P_t(t) \rangle$

$y(\tau) = \int \cos^2(2\pi t)\, P_t^*(t)\, dt$

$P_t(t)$ → Real Signal.

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$$y(\tau) = \int \frac{1+\cos 4\pi t}{2} \cdot P_2(t)\, dt$$

$$= \frac{1}{2} \int_{\tau}^{\tau+1/2} (1+\cos 4\pi t) \cdot 1 \, dt$$

$$= \frac{1}{2}\left[t + \frac{\sin 4\pi t}{4\pi} \right]_{\tau}^{\tau+1/2}$$

$$= \frac{1}{4}$$