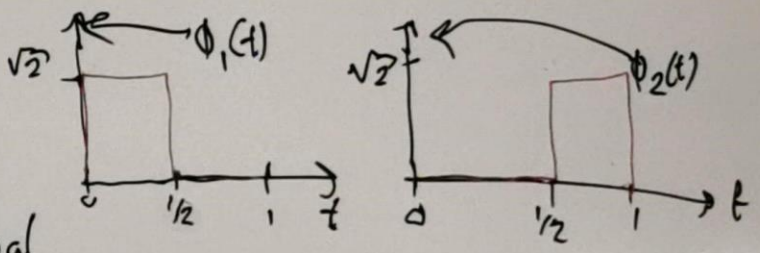
Adv. SP (not Peter) 1

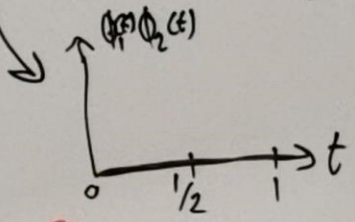
$\Phi = \{\phi_1(t), \phi_2(t)\}$

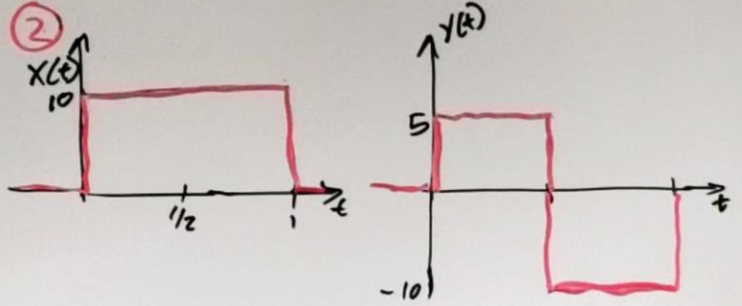


① Confirm Φ is orthonormal

$\langle \phi_1(t), \phi_2(t) \rangle = \int \phi_1(t)\phi_2(t)\,dt = 0 \Rightarrow \cos(\theta) = 0 \Rightarrow \theta = 90°$

$\langle \phi_1, \phi_1 \rangle = \int \phi_1^2(t)\,dt = \sqrt{2}^2 \cdot \tfrac{1}{2} = 1$; dst samme for $\langle \phi_2, \phi_2 \rangle$



② 

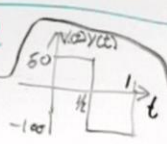
Check $x(t), y(t)$ are in V

$x(t) = \underbrace{\sqrt{2}\cdot 5}_{x_1}\phi_1(t) + \underbrace{\sqrt{2}\cdot 5}_{x_2}\phi_2(t)$

$y(t) = \underbrace{\sqrt{2}\cdot 2{,}5}_{y_1}\phi_1(t) - \underbrace{\sqrt{2}\cdot 5}_{y_2}\phi_2(t)$

③ Cos, Sin ... not in V b coz no soft edges uwu

④ Se opg 2

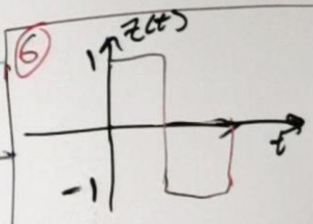


⑤

$\langle x, y \rangle = \int x(t)\,y(t)\,dt = 10 \cdot 5 \cdot \tfrac{1}{2} + (-10) \cdot 10 \cdot \tfrac{1}{2} = -25$

$\sum_n x_n y_n = x_1 \cdot y_1 + x_2 \cdot y_2 = \sqrt{2}\cdot 5 \cdot \sqrt{2}\cdot 2{,}5 + \sqrt{2}\cdot 5(-\sqrt{2}\cdot 5) = 25 - 50 = -25$

It's the same :)

⑥ 

$\langle x, z \rangle = \int x(t)\,z(t)\,dt$

$= 10 \cdot 1 \cdot \tfrac{1}{2} + 10 \cdot (-1) \cdot \tfrac{1}{2}$

$= 0$

$\Rightarrow$ orthogonal

$\sum_n x_n y_n = 0$