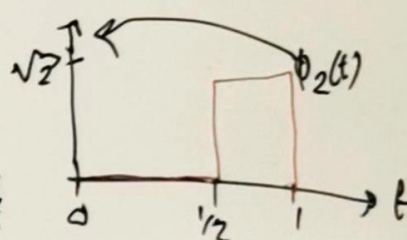
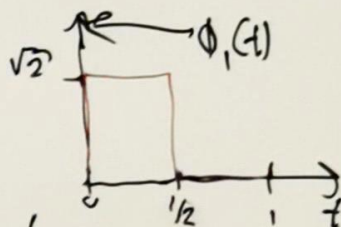


Adv. SP (not Peter) 1

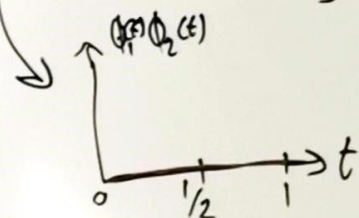
$$\Phi = \{\phi_1(t), \phi_2(t)\}$$



① Confirm Φ is orthonormal

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

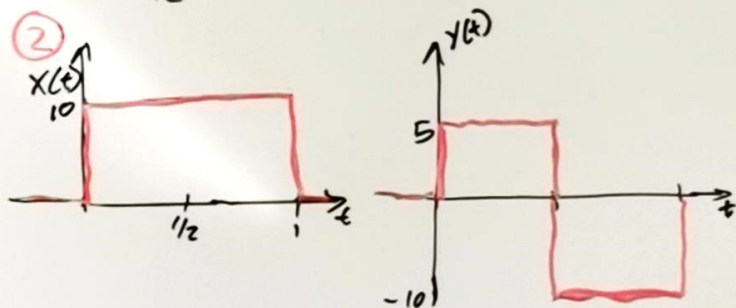
$$\langle \phi_1, \phi_1 \rangle = \int \phi_1^2(t) dt = \sqrt{2}^2 \cdot \frac{1}{2} = 1 \quad ; \quad \text{det same for } \langle \phi_2, \phi_2 \rangle$$



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

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

$$y(t) = \sqrt{2} \cdot 2.5 \phi_1(t) - \sqrt{2} \cdot 5 \phi_2(t)$$



③ $\cos, \sin \dots$ not in V b coz no soft edges

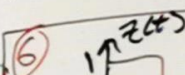
④ See opg 2

⑤

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

$$\sum_n x_n y_n = x_1 \cdot y_1 + x_2 \cdot y_2 = \sqrt{2} \cdot 5 \cdot \sqrt{2} \cdot 2.5 + \sqrt{2} \cdot 5 \cdot \sqrt{2} \cdot (-5) = 25 - 50 = -25$$

It's the same \therefore



$$\begin{aligned} \langle x, z \rangle &= \int x(t) z(t) dt \\ &= 10 \cdot 1 \cdot \frac{1}{2} + 10 \cdot (-1) \cdot \frac{1}{2} \\ &= 0 \\ &\Rightarrow \text{orthogonal} \end{aligned}$$

$$\sum_n x_n x_n = 0$$