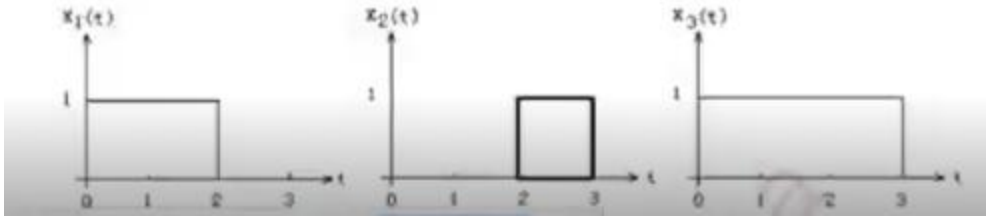
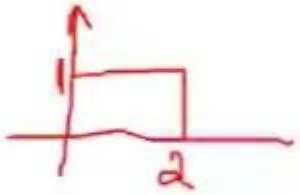
Problem:

Use the Gram-Schmidt procedure to find a set orthonormal basis functions corresponding to the signals show below: Express x1, x2, and x3in terms of the orthonormal basis functions. Draw the constellation diagram for this signal set



$$\phi_1(t) = \frac{x_1(t)}{\sqrt{E_1}} \qquad E_1 = \int_0^T x_1^2(t)\,dt$$

$$= \int_0^2 1^2\,dt = 2$$

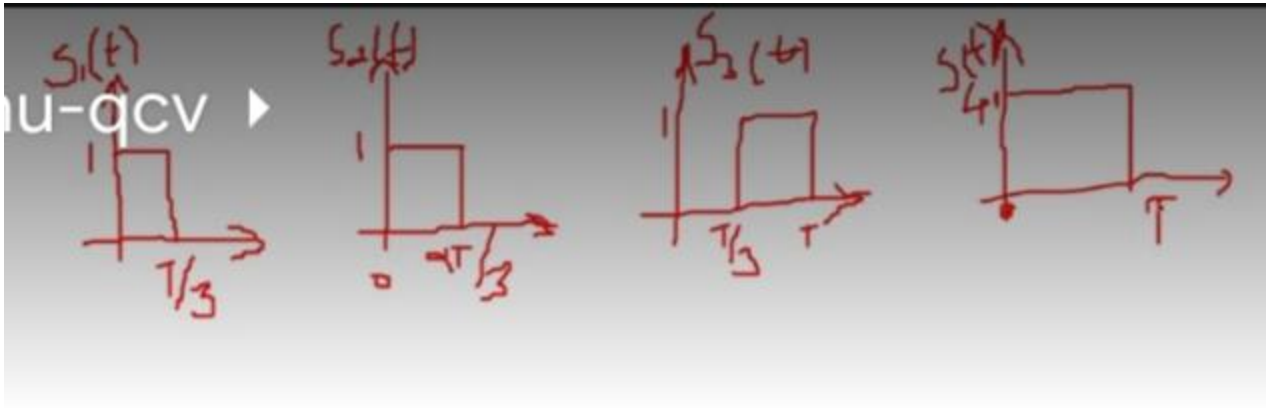


$$\phi_1(t) = \frac{x_1(t)}{\sqrt{2}} = \begin{cases} \frac{1}{\sqrt{2}}, & 0 < t \le 2 \\ 0, & \text{else} \end{cases}$$

$$\phi_i(t) = \frac{g_i(t)}{\sqrt{\int_0^T g_i^2(t)\,dt}}$$

$$g_i(t) = s_i(t) - \sum_{j=1}^{i-1} s_{ij}\,\phi_j(t)$$

$$g_2(t) = s_2(t) - s_{21}\,\phi_1(t)$$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