One way to generate an orthogonal set is use the Gram-Schmidt process starting with a linearly independent set that is not necessarily orthogonal.

(a) Start with the set \( \{1, x, x^2, x^3, x^4, x^5, \ldots \} \) in \( L^2[-1, 1] \). Use the Gram-Schmidt process to compute at least the first six elements of an orthogonal set.

(b) Compute at least the first six terms in the expansion of \( f(x) = \sin(\pi x) \) in terms of the orthogonal set from (a).

(c) Develop conjectures about the convergence of the orthogonal expansion from (b). Give evidence or argument to support each conjecture you make.