Abstract: Traditional function approximation methods approximate functions on sets such as the Chebyshev grid, Monte Carlo set, quasi-Monte Carlo sets, etc. These methods usually assume a simple geometry such as hypercube. However, in practice we may need to approximate functions on arbitrary geometries. Moreover, sets such as Monte-Carlo sets are only ex-ante uniform, but do not possess good uniformity ex-post. In this paper, we use the concept "Epsilon-distinguishable" sets(EDS), which are pre-computed good uniform sets that are geometry-independent and good for approximating function at any sample size. Experiments in this paper show that EDS can compete with widely used sets such as the Chebyshev grid, Monte Carlo set, quasi-Monte Carlo sets, etc.. Function approximation using EDS can greatly reduce the number of function evaluations needed when the target function is costly to evaluate.