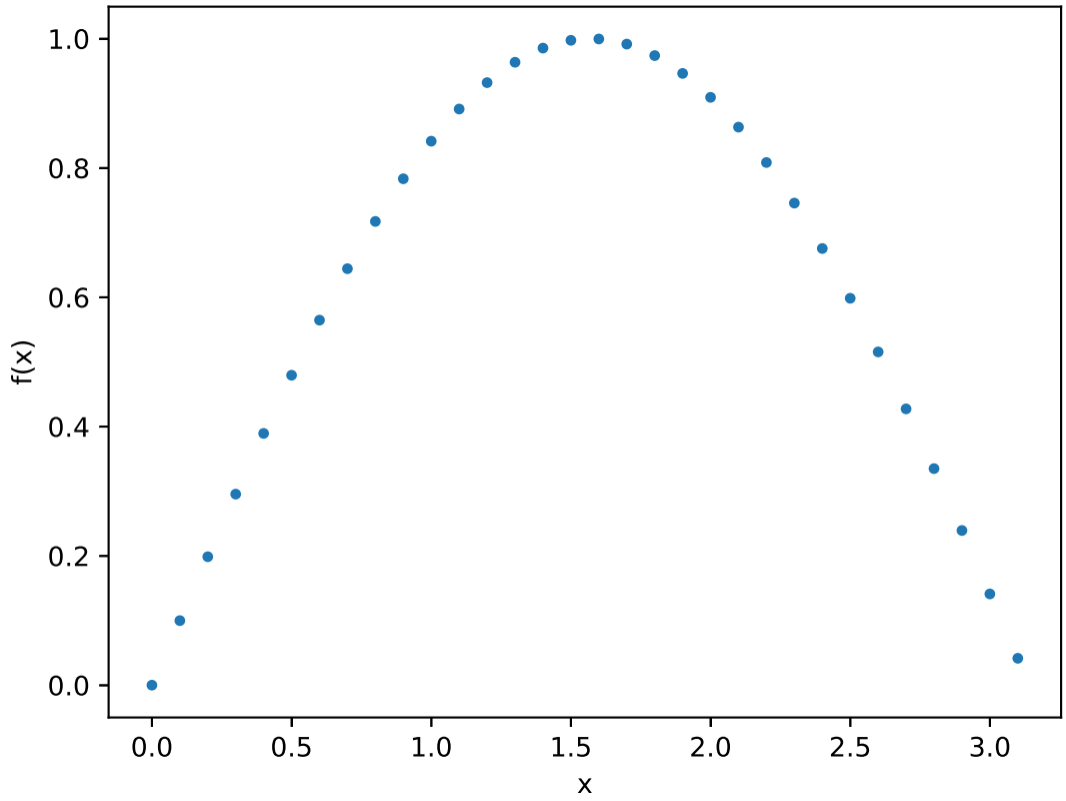
In-class exercise 08

In this exercise, we will do data interpolation on a long series data with 32 data points. The data file is named EX08.dat under the class-exercise folder. The first column is x, and the second column is f(x). The sampling rate of this data is dx=0.1. A plot of the data is shown below:



In this exercise, we will write a code to interpolate the data to have a sampling rate of 0.01.

To do data interpolation:

We can construct a polynomial of maximum degree of n, $P_n(x)$ to fit $n+1$ data points of $(x_0, f(x_0))$, $(x_1, f(1))$, …, $(x_n, f(x_n))$. The $P_n(x)$ is defined as:

$$P_n(x) = \sum_{i=0}^{n} l_i(x) f(x_i)$$

where $l_i(x)$ is:

$$l_i(x) = \frac{(x-x_0)(x-x_1)\cdots(x-x_{i-1})(x-x_{i+1})\cdots(x-x_n)}{(x_i-x_0)(x_i-x_1)\cdots(x_i-x_{i-1})(x_i-x_{i+1})\cdots(x_i-x_n)}$$