

3.1 Interpolation and the Lagrange Polynomial

1) Lagrange Interpolating Polynomial

Problem: Given the values of the function $f(x)$ at $n+1$ distinct points

$$\begin{array}{cccc} x_0 & x_1 & \dots & x_n \\ f_0 & f_1 & \dots & f_n \end{array}$$

where

$$f_i = f(x_i) \quad i=0, 1, \dots, n$$

Find a polynomial of degree n , $P(x)$ such that

$$P(x_i) = f_i \quad i=0, 1, \dots, n.$$

Simplest case: Linear interpolation: Given

$$\begin{array}{cc} x_0 & x_1 \\ f_0 & f_1 \end{array}$$

Find a polynomial of degree one such that

$$P(x_0) = f_0 \quad P(x_1) = f_1$$

