In-class exercise 07

In the Table below, we have 3 data points of f(0)=1, f(1)=3, and f(3)=35

x	0	1	3
$f(x)$	1	3	55

What is the function of the polynomial $P_2(x)$? What is the interpolated value at x=0.5 and x=2.0?

Let's first work by hand and then by coding.

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:

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