

3
a

$$f(x) = e^x$$

KNOWN AT

$$x_0 = 0$$

$$x_1 = 1$$

$$x_2 = 2$$

$$x_3 = 4$$

WRITE THE INTERPOLATING
POLY IN LAGRANGE
FORM

$$P_n(x) = \sum_{k=0}^n f(x_k) l_k(x) = \sum_{k=0}^3 e^{x_k} l_k(x)$$

$$= e^{x_0} l_0 + e^{x_1} l_1 + e^{x_2} l_2 + e^{x_3} l_3$$

$$l_n = \prod_{\substack{i=0 \\ i \neq n}}^n \frac{x - x_i}{x_n - x_i}$$

$$l_0 = \prod_{\substack{i=1 \\ i \neq 0}}^3 \frac{x - x_i}{x_0 - x_i} = \frac{x - x_1}{x_0 - x_1} \cdot \frac{x - x_2}{x_0 - x_2} \cdot \dots \cdot \frac{x - x_3}{x_0 - x_3}$$

$$= \frac{x-1}{0-1} \cdot \frac{x-2}{0-2} \cdot \frac{x-4}{0-4}$$

$$l_0 = -\frac{1}{8}(x-1)(x-2)(x-4)$$

$$l_1 = \prod_{\substack{i=0 \\ i \neq 1}}^3 \frac{x - x_i}{x_1 - x_i} = \frac{x - x_0}{x_1 - x_0} \cdot \frac{x - x_2}{x_1 - x_2} \cdot \frac{x - x_3}{x_1 - x_3} = \frac{x-0}{1-0} \cdot \frac{x-2}{1-2} \cdot \frac{x-4}{1-4}$$

$$l_1 = \frac{1}{3} x(x-2)(x-4)$$