INTERPOLATION

$f(x) = e^x$

EXAMPLE 7.2

INTERPOLATING POLYN. FOR 3 KNOWN POINTS

WE KNOW

$x_0 = 0$	$y_0 = f(x_0) = e^0 = 1$
$x_1 = 1$	$y_1 = f(x_1) = e^1$
$x_2 = 2$	$y_2 = f(x_2) = e^2$
$x_3 = 3$	$y_3 = f(x_3) = e^3$

WRITE THE INTERPOLATING POLYNOMIAL IN LAGRANGE FORM

LAGRANGE FORM FOR POLY DEG (3)

3 POINTS DATA

$$P_{n=3}(t) = y_n l_n(t) \quad ; \quad (t_i, y_i)$$

HAVE POINTS $(t_1, y_1), (t_2, y_2), (t_3, y_3)$

THEN,

$$P_2(t) = y_1 \frac{(t-t_2)(t-t_3)}{(t_1-t_2)(t_1-t_3)} + y_2$$

INTERPOLATION METHOD(?) OF OF LAGRANGE:

LAGRANGE BASIS FUNCT.'S,

$$l_j(t) = \frac{\prod_{k=1,\, k\neq j}^{n} (t-t_k)}{\prod_{k=1,\, k\neq j}^{n} (t_j-t_k)} \quad , j = 1, \ldots, n$$

IT MUST BE,

$$l_j(t_i) = \begin{cases} 1 & i = j \\ 0 & i \neq j \end{cases} \qquad i, j = 1, \ldots, n$$

USING THE LAGRANGE BASIS, THE POLYNOMIAL INTERPOLATING THE DATA POINTS, (t_i, y_i) ARE GIVN BY,

$$P_{n-1}(t) = y_n l_n(t)$$