Newton divided difference forom

Here
$$a_0 = f[x_0]$$

$$a_1 = f[x_0, x_1]$$

$$a_2 = f[x_0, x_1, x_2]$$

$$a_3 = f[x_0, x_1, x_2, x_3]$$

$$a_4 = f[x_0, x_1, x_2, x_3, x_4]$$

$$\vdots$$

$$a_n = f[x_0, x_1, x_2, x_3, --x_n]$$

to We wrate it directly in the equation.

$$P_{n}(x) = f[x_{0}] + f[x_{0},x_{1}](x-x_{0}) + f[x_{0},x_{1},x_{2}](x-x_{0})(x-x_{1}) + f[x_{0},x_{1},x_{2},x_{3}](x-x_{0})(x-x_{1})(x-x_{2}) + --- + f[x_{0},x_{1},-..,x_{1}](x-x_{0})(x-x_{1}) - -..(x-x_{n-1}) -$$

main polynomial forc newton divided difference forom.

Example 1 Parct 1

$$\chi \qquad f(\chi)$$

$$\chi_0 = -1 \qquad f = f(\chi_0)$$

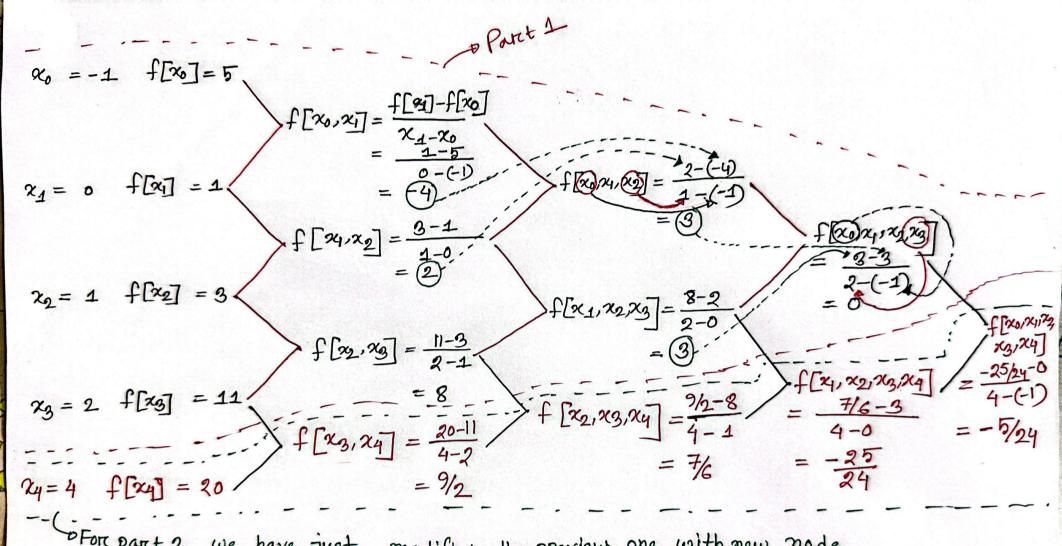
$$\chi_1 = 0 \qquad 1 = f(\chi_1)$$

$$\chi_2 = 1 \qquad 3 = f(\chi_2)$$

$$\chi_3 = 2 \qquad 11 = f(\chi_3)$$

$$P_{3}(x) = f[x_{0}] + f[x_{0}, x_{1}](x-x_{0}) + f[x_{0}, x_{1}, x_{2}](x-x_{0})(x-x_{1})$$

$$+ f[x_{0}, x_{1}, x_{2}, x_{3}](x-x_{0})(x-x_{1})(x-x_{2})$$



oFor part 2 we have just modified the previous one with new node

** Advantage: Here new data can be incorrportated easily we don't need to calculate from the beginning. **

$$\begin{array}{l} \text{...} \ \beta_{0}(\alpha) = f[x_{0}] + f[x_{0}, x_{1}] (\alpha - x_{0}) + f[x_{0}, x_{4}, x_{2}] (\alpha - x_{0}) (\alpha - x_{0}) \\ + f[x_{0}, x_{4}, x_{2}, x_{3}] (\alpha - x_{0}) (\alpha - x_{0}) (\alpha - x_{0}) \\ = 5 + (-4) (\alpha + 1) + 6 (\alpha + 1) (\alpha - 0) + 6 \times (\alpha + 1) (\alpha - 0) \\ (\alpha - 1) \end{array}$$

= 5 - 4(x+1) + 3x(x+1)

Parct 23

Now if we asked to add another node then what it will look like

$$P_{4}(x) = f[x_{0}] + f[x_{0}, x_{1}] (x-x_{0}) + f[x_{0}, x_{1}, x_{2}] (x-x_{0}) (x-x_{1})$$

$$+ f[x_{0}, x_{1}, x_{2}, x_{3}] (x-x_{0}) (x-x_{1}) (x-x_{2}) + f[x_{0}, x_{1}, x_{2}, x_{3}, x_{2}]$$

$$(x-x_{0}) (x-x_{1}) (x-x_{2}) (x-x_{3})$$

$$= 5 + (-4)(x+1) + 3(x+1)(x-0) + 0 \times (x+1)(x-0)(x-1)$$

$$+ (-5/24) (x+1)(x-0) (x-1)(x-2)$$

$$= 5 - 4(x+1) + 3 \times (x+1) - 5/2 \times (x+1)$$

