PRACTICAL 6(b)

Aim: To find the interpolating polynomial for some given data using Newton interpolation.

ASSIGNMENT

1 *Q1.Using Newton's divided difference interpolation, find y(10) given that y(5) = 12, y(6) = 13, y(9) = 14, y(11) = 16.*

(%i16)
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kill(all)$
x = x: [5, 6, 9, 11];
y: zeromatrix(4, 4)$
y[1][1] : 12$
y[2][1] : 13$
y[3][1] : 14$
y[4][1] : 16$
'y = y;
n: length(x)$
for i: 2 thru n do (
    for j: 1 thru n - i + 1 do (
    y[j][i]: (y[j + 1][i - 1] - y[j][i - 1]) / (x[j + i - 1] - x[j])
    )
)$
x_t: 1$
f: y[1][1]$
for j: 1 thru n - 1 do (
    x_t: x_t · ('x - x[j]),
    f: f + y[1][j + 1] · x_t,
    print("iteration", j, "=>", expand(f))
)$
'b = y;
'f('x) = expand(f);
print("f(10) =", ev(f, x = 10))$
wxplot2d([f, [discrete, x, args(map(first, y))]],
    ['x,-1, 20], [legend, "f(x)", "given"]);
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(%o1) $x=[5,6,9,11]$

(%o7) $$y=\begin{pmatrix} 12 & 0 & 0 & 0 \\ 13 & 0 & 0 & 0 \\ 14 & 0 & 0 & 0 \\ 16 & 0 & 0 & 0 \end{pmatrix}$$

iteration 1 => $x+7$

iteration 2 => $-\frac{x^2}{6}+\frac{17x}{6}+2$

iteration 3 => $\frac{x^3}{20}-\frac{7x^2}{6}+\frac{557x}{60}-\frac{23}{2}$

(%o13) $$b=\begin{pmatrix} 12 & 1 & -\frac{1}{6} & \frac{1}{20} \\ 13 & \frac{1}{3} & \frac{2}{15} & 0 \\ 14 & 1 & 0 & 0 \\ 16 & 0 & 0 & 0 \end{pmatrix}$$

(%o14) $f(x)=\frac{x^3}{20}-\frac{7x^2}{6}+\frac{557x}{60}-\frac{23}{2}$

$f(10)=\frac{44}{3}$