PRACTICAL 6(b)- NEWTON DIVIDED DIFFERENCE INTERPOLATING POLYNOMIAL P.I COMPUTING DIVIDED DIFFERENCE

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```
NthDividedDiff[x0_, f0_, startindex_, endindex_] :=
  Module[{x = x0, f = f0, i = startindex, j = endindex, answer},
   If[i == j, Return[f[[i]]], answer =
       (NthDividedDiff[x, f, i + 1, j] - NthDividedDiff[x, f, i, j - 1])/
                                  x[[j]] - x[[i]];
     Return[answer]];
  ];
x = {0, 1, 3};
f = {1, 3, 55};
NthDividedDiff[x, f, 1, 2]
```

```
2
```

```
x = {0, 1, 3};
f = {1, 3, 55};
NthDividedDiff[x, f, 2, 3]
```

```
26
```

```
NthDividedDiff[x, f, 1, 3]
```

```
8
```

```
x = {-1, 0, 1, 2};
f = {5, 1, 1, 11};
NthDividedDiff[x, f, 1, 2]
```

```
-4
```

```
NthDividedDiff[x, f, 2, 3]
```

```
0
```

```
NthDividedDiff[x, f, 1, 3]
```

```
2
```

```
NthDividedDiff[x, f, 2, 4]
```

```
5
```

```
NthDividedDiff[x, f, 1, 4]
```

```
1
```

```
NewtonDDPoly[x0_, f0_] :=
  Module[{x1 = x0, f = f0, n, newtonPloynomial, k, j},
   n = Length[x1];
   newtonPolynomial[y_] = 0;
   For[i = 1, i ≤ n, i++,
    prod[y_] = 1;
    For[k = 1, k ≤ i - 1, k++,
     prod[y_] = prod[y] * (y - x1[[k]])];
    newtonPolynomial[y_] =
     newtonPolynomial[y] + NthDividedDiff[x1, f, 1, i] * prod[y]];
   Return[newtonPolynomial[y]];];
nodes = {0, 1, 3};
values = {1, 3, 55};
NewtonDDPoly[nodes, values]
```

$$1 + 2\,y + 8\,(-1 + y)\,y$$

```
Simplify[1 + 2 y + 8 (-1 + y) y]
```

$$1 - 6\,y + 8\,y^2$$

```
nodes = {-1, 0, 1, 2};
values = {5, 1, 1, 11};
NewtonDDPoly[nodes, values]
```

$$5 - 4\,(1 + y) + 2\,y\,(1 + y) + (-1 + y)\,y\,(1 + y)$$

```
Simplify[5 - 4 (1 + y) + 2 y (1 + y) + (-1 + y) y (1 + y)]
```

$$1 - 3\,y + 2\,y^2 + y^3$$