Lab Nr. 3, Numerical Calculus

Divided and Finite Differences

1. Write a MATLAB function that generates the divided differences table, given the nodes and the function values (i.e., for *simple* nodes).

2. Write a MATLAB function that generates the divided differences table, given the nodes, the function and the derivative values (i.e., for *double* nodes).

3. Write MATLAB functions that generate *forward* and *backward* finite differences tables, given the function values (at equidistant nodes).

Applications

1. Let $f : (-1, \infty) \to \mathbb{R}$ be defined by $f(x) = \dfrac{1}{1+x}$.

- **a)** Find the divided differences table of f at the simple nodes $x_0 = 0, x_1 = 1, x_2 = 2$;
- **b)** Find the divided differences table of f at the double nodes $x_0 = 0, x_1 = 1, x_2 = 2$;
- **c)** Repeat parts **a)** and **b)** at 11 equidistant nodes on the interval $[1, 2]$.

2. The following data is gathered:

x	-2	-1	0	1	2	3	4
f	-5	1	1	1	7	25	60

- **a)** Construct the divided differences table of the data;
- **b)** Find the forward differences table of the data;
- **c)** Find the backward differences table of the data.