3.2/

Neville's Method

1. **What?**

2. **Why?**

3. **The lagrange Polynomial of the point x_{m_i}:**

4. **Method to recursively generate Lagrange polynomial:**
    - **Method:**
    - **Examples:**
    - **Generated according to the following Table:**

5. **Notation and subscripts:**
    - Proceeding down the table corresponds to
    - Proceeding to the right corresponds to
    - **To avoid the multiple subscripts**, we

: $Q_{i,j} =$

6. **Algorithm:**

7. **Stopping Criterion:**
    - Criterion:
    - If the inequality is true, $Q_{i,i}$ is
    - If the inequality is false,

3.3/

Divided Differences

1. **What?**

2. **Form of the Polynomial:**
   - $P_n(x) =$
   - **Evaluated at x_0:**
   - **Evaluated at x_1:**
   - $\implies$.
3. **The divided differences:**
   - **The *zeroth* divided difference** of the function f with respect to x_i:
     - **Denoted:**
     - **Defined:**
     - $f[x_i] =$.
   - The remaining divided differences are defined:
   - **The *first* divided difference** of f with respect to x_i and x_{i+1}:
     - **Denoted:**
     - **Defined:**
   - **The *second* divided difference** of f with respect to x_i, x_{i+1} and x_{i+2}:
     - **Denoted:**
     - **Defined:**

- **The *Kth* divided difference** of f with respect to $x_i, x_{i+1}, \ldots, x_{i+k-1}, x_{i+k}$:
  - **Denoted:**
  - **Defined:**

- > The process ends with

- **The *nth* divided difference** of f with respect to $x_i, x_{i+1}, \ldots, x_{i+k-1}, x_{i+k}$:
  - **Denoted:**
  - **Defined:**

4. **The Interpolating Polynomial:**

   $P_n(x) =$

5. **Newton's Divided Difference:**

   $P_n(x) =$

> The value of $f[x_0, x_1, \ldots, x_k]$ is

6. **Generation of Divided Differences:**

7. **Algorithm:**

Forward Differences

1. **Forward Difference:**

2. **The divided differences (with del notation):**

and in general,

3. **Newton Forward-Difference Formula:**

Backward Differences

1. **Backward Difference:**

2. **The divided differences:**

> and in general,

> Consequently, the Interpolating Polynomial \

> If we extend the binomial coefficient notation to

> then \

3. **Newton Backward–Difference Formula:**

Centered Differences

1. **What?**

2. **Why?**

3. **Stirling's Formula:**
   - **If $n = 2m + 1$ is odd:**

   - **If $n = 2m$ is even:** [we use the same formula but delete the last line]

4. **Table of Entries:**