Introduction

Numerical integration using Newton formulae:

- can handle any function;
- simple;
- can handle measured data easily.

Trapezium rule for an interval from \( x = x_i \) to \( x_{i+1} \):

\[
\int_{x_i}^{x_{i+1}} f(x) \, dx \approx (x_{i+1} - x_i) \frac{f(x_i) + f(x_{i+1})}{2}
\]

Simpson rule for an interval from \( x = x_i \) to \( x_{i+1} \):

\[
\int_{x_i}^{x_{i+1}} f(x) \, dx \approx (x_{i+1} - x_i) \frac{f(x_i) + 4f(x_{i+rac{1}{2}}) + f(x_{i+1})}{6}
\]
These rules are accurate if the interval from $x_i$ to $x_{i+1}$ is sufficiently small. To integrate over an interval that is not small, divide it into small ones, then integrate over each small interval and add the results.