nth order non-uniform grid stencils

This document contains the derivation of the 1st and 2nd derivatives of a function using function values at locations . The following analysis is valid for non-uniform grids.

# Results

These results were obtained by solving the following system of equations

In this system, we need to solve for , and eliminate . Rewriting this equation as

The left hand side is known, the first term in the RHS is what we're looking for, and the remaining derivatives must be solved for. Let's put this in

Therefore we have

And we only wish to find from .