Higher Order Interpolation Formulas New

# 3rd order cell based extrapolation

These formulas require using data from the "known" data set ONLY, since the intermediate values are linearly interpolated. Using both known and recently found values will result in a linear interpolation using 3 function values.

## Backward Extrapolation

Approximating several function values around we have

We may rewrite this as

Or

In matrix form we may write

Where

This algebra was already done in the previous document. It will not be repeated here. The final result should be

### Result

Or

## Forward Extrapolation

This is very similar to the backward extrapolation, the only difference here is that we are now looking for a different function location and we approximate closer to the end point. Approximating several function values around we have

We may rewrite this as

Or

In matrix form we may write

Where

This algebra was already done in the previous document. It will not be repeated here. The final result should be

### Result

Or

# 4th order interpolation

Here, let's approximate a function around

We may write this as

In matrix form we may write

Where

Our solution is

Let's look at these separately

Let's look at these separately...