

Suppose all points are the same
Then

$$f[\underbrace{x_0, \dots, x_0}_{n+1}] = \frac{f^{(n)}(x_0)}{n!}$$

In particular

$$f[x_0, x_0] = f'(x_0)$$

Thus, originally we could compute the divided differences only with different points. Now, we know how to compute them with all points the same. Consequently, we can compute them with some points the same and some different

Ex: $f[x_0, x_0, x_1] = \frac{f[x_0, x_0] - f[x_0, x_1]}{x_1 - x_0} = \frac{f'(x_0) - f[x_0, x_1]}{x_1 - x_0}$

How does this help us? From the distinct points

x_0, \dots, x_n

we construct the points

$$\underbrace{x_0, \dots, x_0}_{m_0+1 \text{ times}}, \underbrace{x_1, \dots, x_1}_{m_1+1 \text{ times}}, \dots, \underbrace{x_n, \dots, x_n}_{m_n+1 \text{ times}}$$

Let's call these points