$= 0.423 + 0.4306 + 0.0456 - 0.006 = 0.893$

Note: The function actually is $f(x) = \tan x$
So $f(0.73) = 0.895$. Thus, the error is 0.002.

Similarly, we can define backward differences. Consider the points

$$x_n, x_{n-1}, \ldots, x_0$$

Def: The <u>first backward difference</u> at x_i is defined as

$$\nabla f(x_i) = f(x_i) - f(x_{i-1})$$

Note: $\nabla f(x_i) = \Delta f(x_{i-1})$

Def: The <u>k^{th} backward difference</u> at x_i is defined as

$$\nabla^k f(x_i) = \nabla^{k-1} f(x_i) - \nabla^{k-1} f(x_{i-1})$$

<u>Newton's backward-difference formula</u>:

$$P_n(x_0 + sh) = P_n(s) = f(x_n) + s\nabla f(x_n) + \frac{s(s+1)}{2!}\nabla^2 f(x_n) + \frac{s(s+1)(s+2)}{3!}\nabla^3 f(x_n)$$

$$+ \ldots + \frac{s(s+1)\cdots(s+n-1)}{n!}\nabla^n f(x_n)$$