이차함수 함숫값 찾기

- 증가량(t) 공식

$f''(x) = h, \quad f(n) = a, \quad f(m) = b \quad (m-n>1)$

$$f(n+1) - f(n) = t$$

$$b = a + (m-n)t + \sum_{i=1}^{m-n-1} hi$$

$$(m-n)t = b - a - \sum_{i=1}^{m-n-1} hi$$

$$t = \frac{b - a - \sum_{i=1}^{m-n-1} hi}{m-n}$$

ex. 1)

$f(x) = 2x^2 + 5x$

$f''(x) = 4$

$f(2) = 18$

$f(4) = 52$

$$t = \frac{52 - 18 - \sum_{i=1}^{4-2-1} 4i}{4-2} = \frac{34-4}{2} = 15 = f(3) - f(2)$$

$f(2)$	$f(3)$	$f(4)$	$f(5)$	$f(6)$	......
18	33	51	74	101	......
15	19	23	27	......	
4	4	4	......		

ex. 2)

$f(x) = 3x^2 + 5$

$f''(x) = 6$

$f(1) = 8$

$f(5) = 80$

$$t = \frac{80 - 8 - \sum_{i=1}^{5-1-1} 6i}{5-1} = \frac{72 - 36}{4}$$

$= 9$

$= f(2) - f(1)$

f(1) f(2) f(3) f(4) f(5) ⋯⋯

8 17 32 53 80

9 15 21 27 ⋯⋯

6 6 6 ⋯⋯

이계도 함수와 두 개의 함숫값을

알고 있으면 쉽게 다른 함숫값도 찾을 수 있음.

ㅡ 함숫값 공식

$$f''(x) = h, \quad f(n) = a, \quad t = f(n+1) - f(n)$$

$$f(x) = a + (x-n)t + \sum_{i=1}^{|m-n-1|} hi \quad (x > n)$$

$$f(x) = a + (x-n)t + \sum_{i=1}^{|m-n|} \quad (x < n)$$

$$\begin{tikzcd}
f(n-2) \arrow[d] & f(n-1) \arrow[d] & f(n) \arrow[d] & f(n+1) \arrow[d] & f(n+2) \arrow[d] \\
f(n)-2t+3h & f(n)-t+h \arrow[l, bend left, "t-2h"] & f(n) \arrow[l, bend left, "t-h"] \arrow[r, bend right, "t"'] & f(n)+t \arrow[r, bend right, "t+h"'] & f(n)+2t+h
\end{tikzcd}$$

ex)

$$f(x)=2x^2+5x$$

$$f''(x)=4$$

$$f(1)=7$$

$$f(5)=75$$

$$t=\frac{b-a-\sum_{i=1}^{m-n-1} hi}{m-n}=\frac{75-7-\sum_{i=1}^{5-1-1} 4i}{5-1}=\frac{68-24}{4}=11$$

$$f(x)=a+(x-n)t+\sum_{i=1}^{|x-n-1|} hi \quad (x>n)$$

$$f(x)=a+(x-n)t+\sum_{i=1}^{|x-n|} hi \quad (x<n)$$

$$f(38)=7+(38-1)t+\sum_{i=1}^{|38-1-1|} 4i$$

$$=7+37t+2664$$

$$=37\times 11+2671$$

$$=407+2671=3078$$

+ 실수로 범위 확장

$f(x)=2x^2+5x$

$f''(x)=4$

Scale $=1$

$f(1)$ $\quad f(1.1)$ $\quad f(1.2)$ $\quad f(1.3)$ $\quad \cdots\cdots \quad f(2)$

$t \qquad t+0.04 \qquad t+0.08$

$+0.04 \qquad +0.04$

Scale $=2$

$f(1)$ $\quad f(1.01)$ $\quad f(1.02)$ $\quad f(1.03)$ $\quad \cdots \quad f(1.1)$

$t \qquad t+0.0004 \qquad t+0.0008$

$+0.0004 \qquad +0.0004$

$\vdots$

Scale = 소수점 자리수

예) Scale = 0 이면, 정수만 가능.

Scale=1 이면, 소수점 1의 자리까지 다룰 수 있음.

$f'(x) = h,\quad f(n) = a,\quad f(m) = b$

Scale = 0 $\quad (m-n > 1)$

$$t = \frac{b - a - \sum_{i=1}^{m-n-1} h_i}{m-n}$$

$$f(x) = \begin{cases} a + (x-n)t + \sum_{i=1}^{m-n-1} h_i & (x > n) \\ a + (x-n)t + \sum_{i=1}^{m-n} h_i & (x < n) \end{cases}$$

Scale = 1 $\quad (m-n > 0.1)$

$$t = \frac{b - a - \sum_{i=1}^{10(m-n)-1} 0.01 \times h_i}{10(m-n)}$$

$$f(x) = \begin{cases} a + 10(x-n)t + \sum_{i=1}^{10(m-n)-1} 0.01 \times h_i & (x > n) \\ a + 10(x-n)t + \sum_{i=1}^{10(x-n)} 0.01 \times h_i & (x < n) \end{cases}$$

Scale = 2 $\quad (m-n > 0.01)$

$$t = \frac{b - a - \sum_{i=1}^{100(m-n)-1} 0.0001 \times h_i}{100(m-n)}$$

$$f(x) = \begin{cases} a + 100(x-n)t + \sum_{i=1}^{100(x-n)-1} 0.0001 \times h_i & (x > n) \\ a + 100(x-n)t + \sum_{i=1}^{100(x-n)} 0.0001 \times h_i & (x < n) \end{cases}$$

⋮