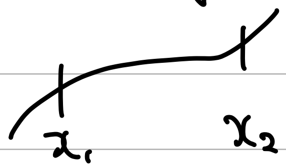
NM11

- increasing

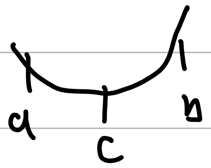


$x_1 < x_2$, $f(x_1) < f(x_2)$

f' +

$x_1 < x_2$, $f'(x) > 0$ 모든 x in (x_1, x_2)

- local minimum



(a,b) 의 모든 x 에 대해 $f(x) \geq f(c)$ 이면

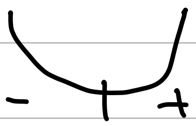
$f(c)$ 가 local min.

//

critical value

($f'(c) = 0$ 이거나, not exist 임.)

first derivative — second derivative



(local min)

$f'(c) = 0$

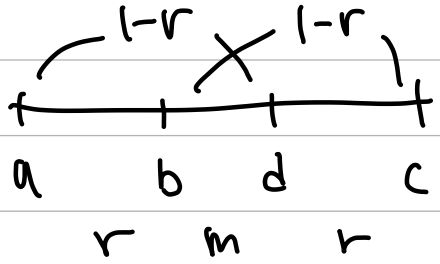
$f''(c) > 0$

- Bracketing method

golden $\quad \dfrac{a+b}{a} = \dfrac{a}{b}$ $\quad \dfrac{1+\sqrt{5}}{2} \leftarrow \varphi^2 - \varphi - 1 = 0$

1.618...

$\dfrac{2}{1+\sqrt{5}} = \dfrac{\sqrt{5}-1}{2}$ $\quad$ 0.618...

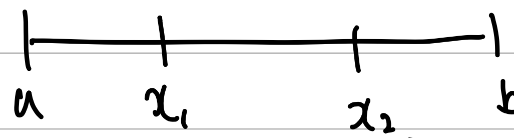


(a, c)

$1-r \approx 0.618$

fibonacci

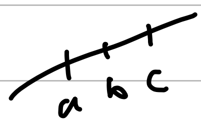
$$F_n = \frac{\varphi^n - (1-\varphi)^n}{\sqrt{5}} = \frac{1}{\sqrt{5}}\left(\left(\frac{1+\sqrt{5}}{2}\right)^n - \left(\frac{1-\sqrt{5}}{2}\right)^n\right)$$



$$a_k + \frac{F_{n-k-2}}{F_{n-k}}(b_k - a_k) \qquad a_k + \frac{F_{n-k-1}}{F_{n-k}}(b_k - a_k)$$

Successive Parabolic interpolation

(세 포인트가 colinear이면 불가)



점 3개 주면 interpolation 해서

최소점을 비교포인트로 설정

$$g(x) = f(a)\frac{(x-b)(x-c)}{(a-b)(a-c)} + f(b)\frac{(x-a)(x-c)}{(b-a)(b-c)} + f(c)\frac{(x-a)(x-b)}{(c-a)(c-b)}$$

$g'(x)=0$ 인 x 찾기

Newton's methods

$$x_{n+1} \leftarrow x_n - \frac{f(x_n)}{f'(x_n)}$$

$$x_{n+1} \leftarrow x_n - \frac{f'(x_n)}{f''(x_n)}$$ 으로 $f'(x)=0$ 인것 찾기

f' f'' 구해야함

또는

$$f''(x_n) = \frac{f'(x_n) - f'(x_{n-1})}{x_n - x_{n-1}}$$ 근사 사용

Secant methods

$$x_{n+1} \leftarrow x_n - f(x_n)\frac{x_n - x_{n-1}}{f(x_n) - f(x_{n-1})}$$

$$x_{n+1} \leftarrow x_n - f'(x_n)\left(\frac{x_n - x_{n-1}}{f'(x_n) - f'(x_{n-1})}\right)$$ 두점과 f' 필요

- 정리

			f' 여부	수렴
golden	bracketing	(초기점 2)	X	linear 0.618
fibonacci			X	linear 조금더 나음
SPI	interpolation	(3)	X	Superlinear
newton		(1)	f' f''	Quadratic
secant		(2)	f'	1.618 superlinear