FACULTAD DE INGENIERIA
Universidad de Buenos Aires

Análisis Numérico / Métodos Matemáticos y Numéricos (75.12/95.04/95.13)

Minimización Numérica

Minimización

Bisección

Dada la siguiente funcion, hallar una aproximación del mínimo en el intervalo [0; 4]

$$f(x) = \frac{x^2}{10} - 2\, sen(x)$$

k	a	m_i	b	m_d	c	f(a)	$f(m_i)$	f(b)	$f(m_d)$	f(c)	delta μ
1	0	1	2	3	4	0,00000	-1,58294	-1,41859	0,61776	3,11360	
2	0	0,5	1	1,5	2	0,00000	-0,93385	-1,58294	-1,76999	-1,41859	0,50000
3	1	1,25	1,5	1,75	2	-1,58294	-1,74172	-1,76999	-1,66172	-1,41859	0,25000
4	1,25	1,375	1,5	1,625	1,75	-1,74172	-1,77272	-1,76999	-1,73300	-1,66172	0,12500
5	1,25	1,3125	1,375	1,4375	1,5	-1,74172	-1,76139	-1,77272	-1,77562	-1,76999	0,06250
6	1,375	1,40625	1,4375	1,46875	1,5	-1,77272	-1,77523	-1,77562	-1,77387	-1,76999	0,03125
7	1,40625	1,421875	1,4375	1,453125	1,46875	-1,77523	-1,77569	-1,77562	-1,77501	-1,77387	0,01563

Minimización

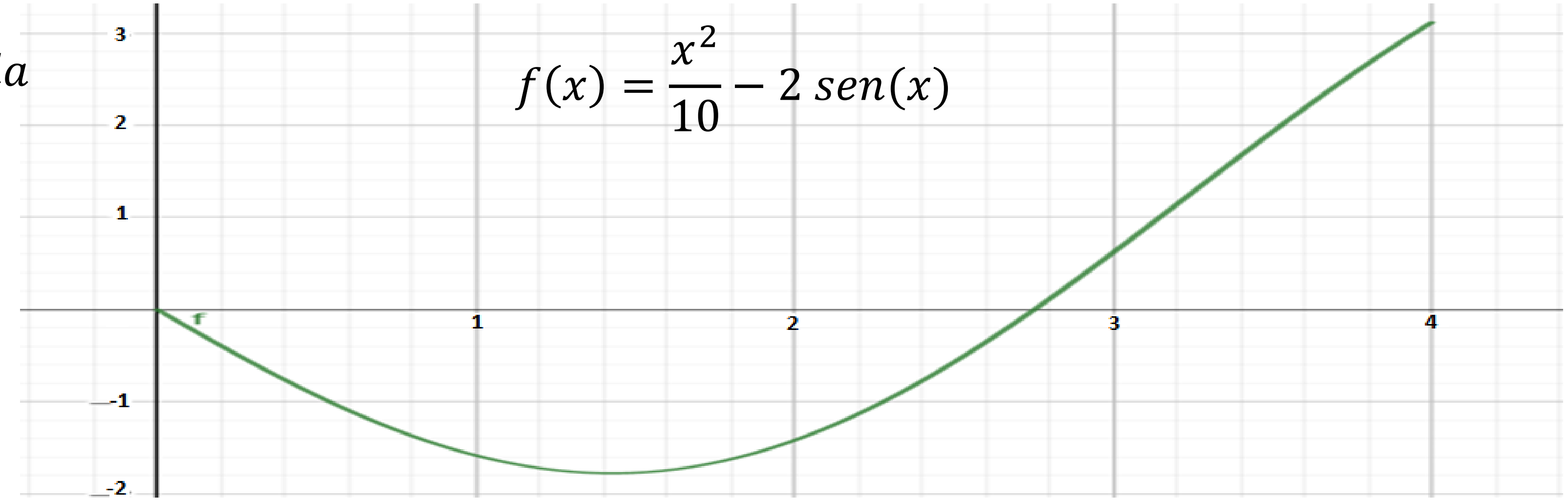
Sección Dorada

Dada la siguiente funcion, hallar una aproximación del mínimo en el intervalo $[0; 4]$

$$f(x) = \frac{x^2}{10} - 2\,sen(x)$$

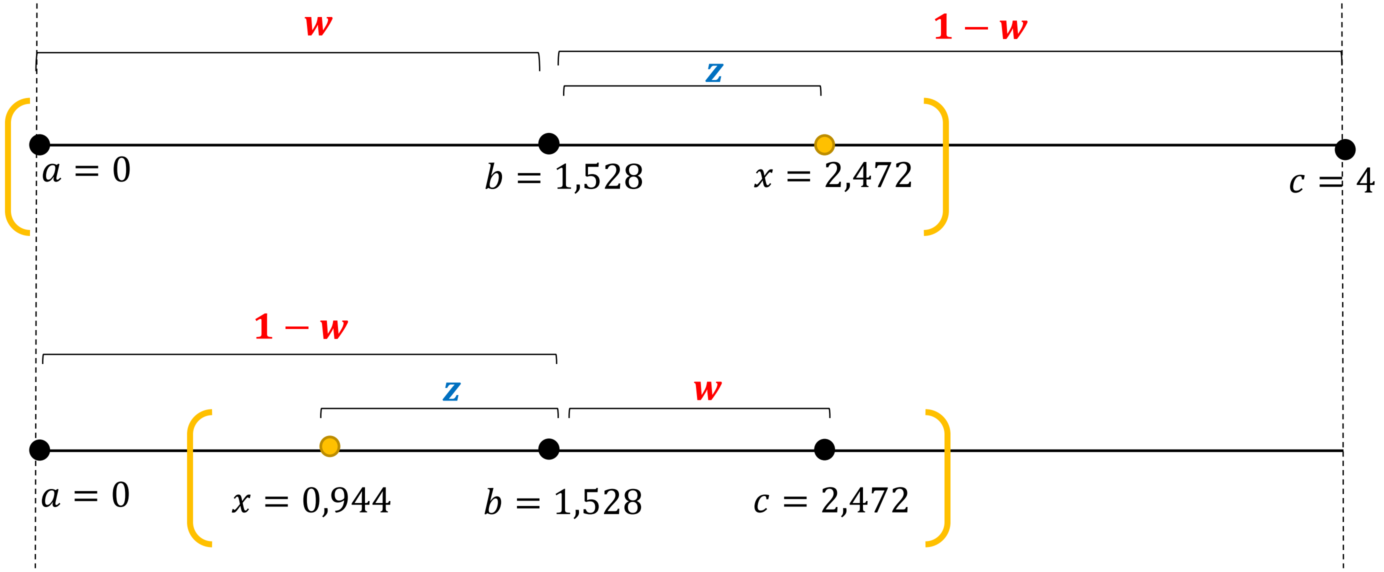
Minimización

Sección Dorada



$$f(x) = \frac{x^2}{10} - 2\,sen(x)$$

$$\frac{w}{\overline{ac}} = \frac{z}{\overline{bc}} \quad ; \quad w + z = 1 - w$$



$f(a) = 0$
$f(b) = -1{,}76$
$f(x) = -0{,}629$
$f(c) = 3{,}11$

$f(a) = 0$
$f(x) = -1{,}53$
$f(b) = -1{,}76$
$f(c) = -0{,}629$

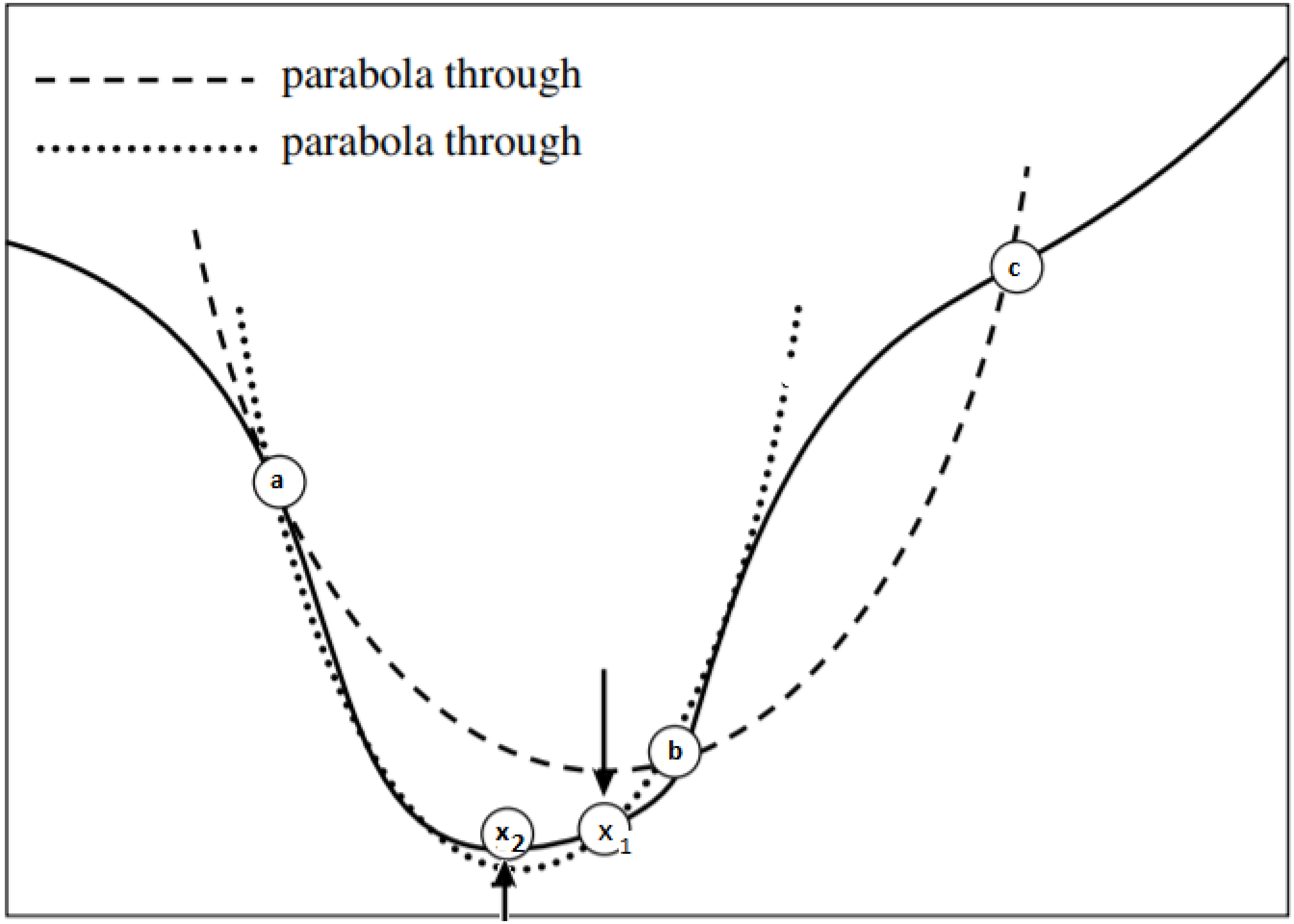
Minimización

k	a	b	x	c	f(a)	f(b)	f(x)	f(c)
1	0	1,52788	2,47215	4	0	-1,76472	-0,62995	3,11360
2	0	0,94427	1,52788	2,47215	0	-1,53097	-1,76472	-0,62995
3	0,94427	1,52788	1,88856	2,47215	-1,53097	-1,76472	-1,54321	-0,62995
4	0,94427	1,30495	1,52788	1,88856	-1,53097	-1,75945	-1,76472	-1,54321
5	1,304952	1,52788	1,66562	1,888529	-1,75945	-1,76472	-1,71359	-1,54324
6	1,304952	1,442717	1,52788	1,66562	-1,75945	-1,77547	-1,76472	-1,71359

Minimización

Interpolación Parabolica Inversa

$$f(x) = \frac{x^2}{10} - 2\,sen(x)$$



Minimización

Interpolación Parabolica Inversa

$$f(x) = \frac{x^2}{10} - 2\,sen(x)$$

$a = 0{,}5$
$b = 1{,}5$
$c = 2{,}5$

3 nodos
grado 2 del polinomio

$$P_2(x) = f(a)\,L_a(x) + f(b)\,L_b(x) + f(c)\,L_c(x)$$

$$L_a(x) = \frac{(x-b)\,(x-c)}{(a-b)\,(a-c)} = \frac{(x-1{,}5)\,(x-2{,}5)}{(0{,}5-1{,}5)\,(0{,}5-2{,}5)}$$

$f(a) = -0{,}934$
$f(b) = -1{,}770$
$f(c) = -0{,}572$

$$L_b(x) = \frac{(x-a)\,(x-c)}{(b-a)\,(b-c)} = \frac{(x-0{,}5)\,(x-2{,}5)}{(1{,}5-0{,}5)\,(1{,}5-2{,}5)}$$

$$L_c(x) = \frac{(x-a)\,(x-b)}{(c-a)\,(c-b)} = \frac{(x-0{,}5)\,(x-1{,}5)}{(2{,}5-0{,}5)\,(2{,}5-1{,}5)}$$

$$P_2(x) = -0{,}934\,\frac{(x-1{,}5)\,(x-2{,}5)}{(0{,}5-1{,}5)\,(0{,}5-2{,}5)} - 1{,}770\,\frac{(x-0{,}5)\,(x-2{,}5)}{(1{,}5-0{,}5)\,(1{,}5-2{,}5)} - 0{,}572\,\frac{(x-0{,}5)\,(x-1{,}5)}{(2{,}5-0{,}5)\,(2{,}5-1{,}5)}$$

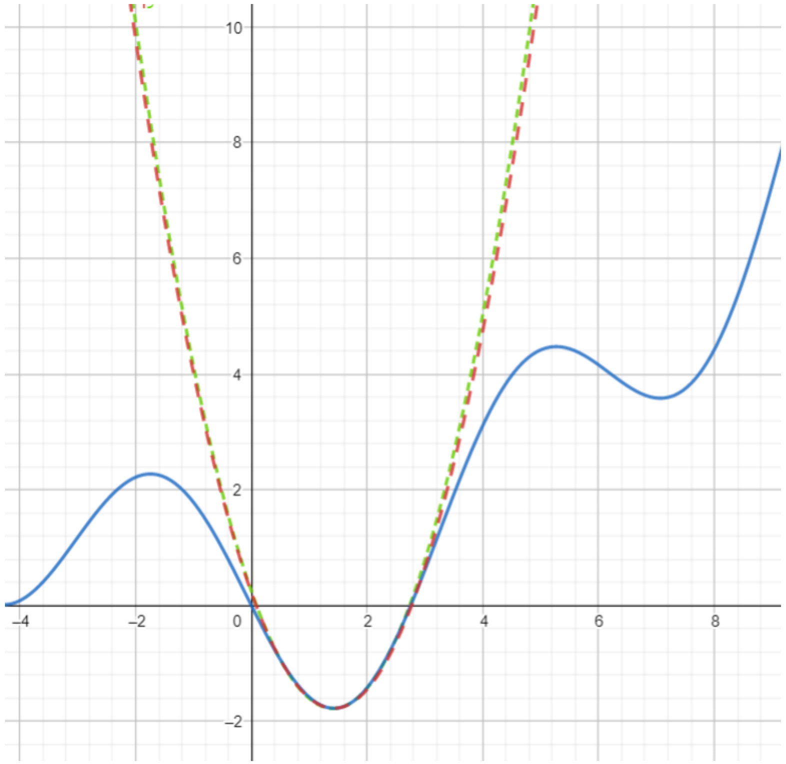
$P'_2(x) = 0$ →

x_{min}=1,41104

Minimización

Interpolación Parabolica Inversa

a	b	c	P_2	x (→ x_{min})	f(a)	f(b)	f(c)	f(x_{min})
0,5	1,5	2,5	$= -0.93385 \cdot \frac{(x-1.5)(x-2.5)}{(0.5-1.5)(0.5-2.5)} - 1.76999 \frac{(x-0.5)(x-2.5)}{(1.5-0.5)(1.5-2.5)} - 0.57194 \cdot \frac{(x-0.5)(x-1.5)}{(2.5-0.5)(2.5-1.5)}$	1,41104	-0,933851	-1,76999	-0,571944	-1,77543
0,5	1,41104	1,5	$= -0.93385 \cdot \frac{(x-1.41104)(x-1.5)}{(0.5-1.41104)(0.5-1.5)} - 1.775429 \cdot \frac{(x-0.5)(x-1.5)}{(1.41104-0.5)(1.41104-1.5)} - 1.76999 \cdot \frac{(x-0.5)(x-1.41104)}{(1.5-0.5)(1.5-1.41104)}$	1,424480	-0,933851	-1,77543	-1,76999	-1,77572



Minimización

Método de Interpolación de Orden Superior

$$f(x) = \frac{x^2}{10} - 2\,sen(x)$$

		f(x)	f'(x)
a	0,5	-0,93385	-1,65517
b	1,5	-1,76999	0,158526
c	2,5	-0,57194	2,102287

$Interpol.\,Hermite$ → $P_5(x)$ → $Interpol.\ Parab.\,Ineversa$