Introducción a las Ecuaciones diferenciales Ordinarias (EDOs IV)

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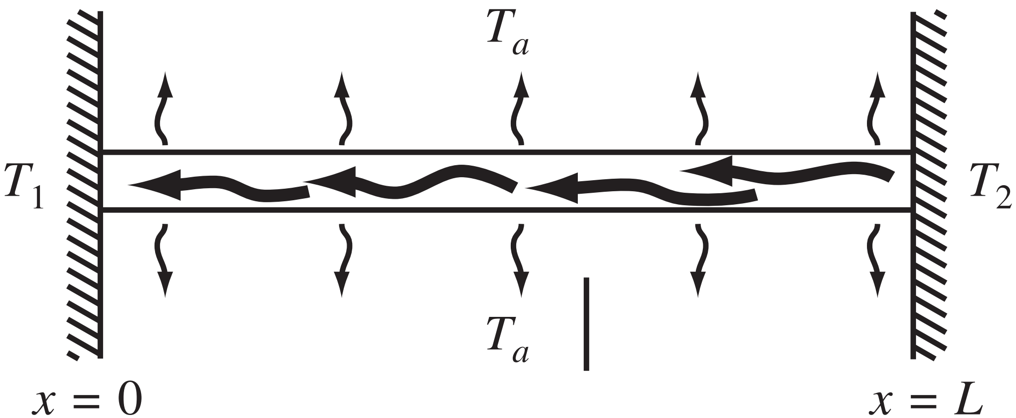
Shooting Method



Barra delgada entre dos fuentes a temperatura constante

$T_a = 20\,^{o}C$

$T_1 = 40\,^{o}C$

$T_2 = 200\,^{o}C$

$h' = 0.01$

$L = 10$

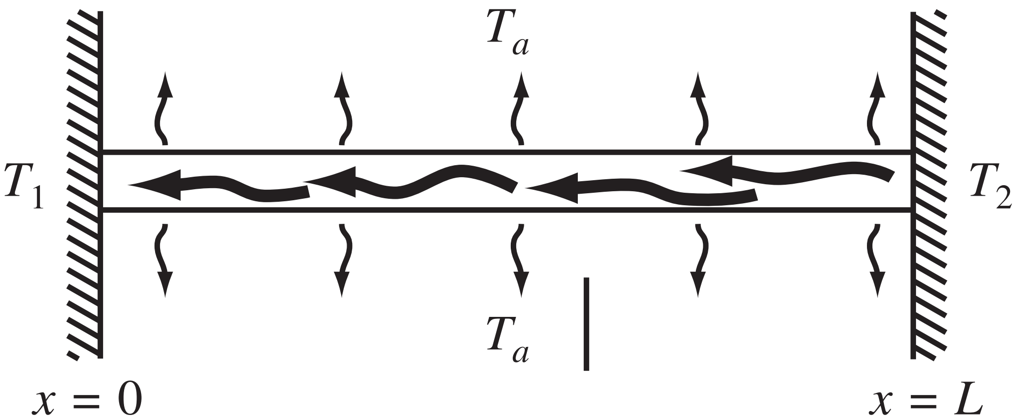
$$\frac{d^2T}{dx^2} + h'(T_a - T) = 0$$

$$\frac{dT}{dx} = z$$

$$\frac{dz}{dx} + h'(T_a - T) = 0$$

$$\begin{cases} \dfrac{dz}{dx} = h'(T - T_a) \\ \dfrac{dT}{dx} = z \end{cases}$$

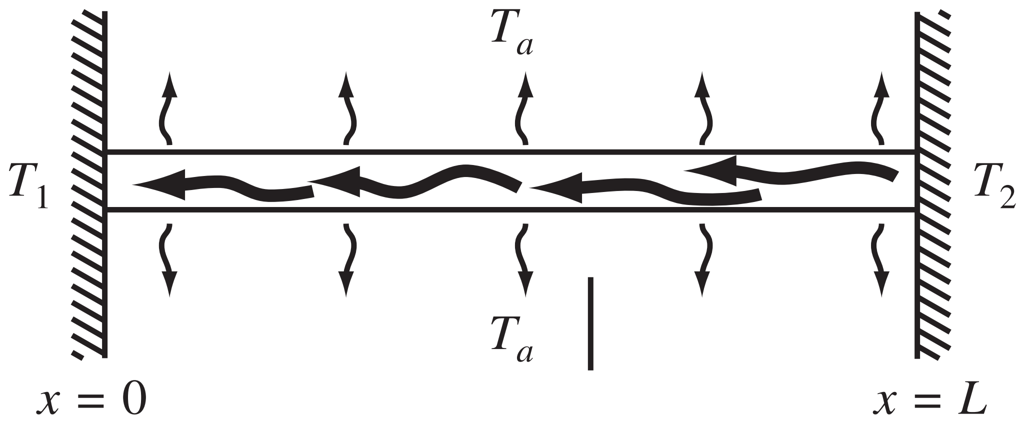
Shooting Method



$$\begin{cases} \dfrac{dz}{dx} = h'(T - T_a) \\ \dfrac{dT}{dx} = z \end{cases}$$

Para que sea un problema de valores iniciales debo conocer z(0) y T(0)

Shooting Method

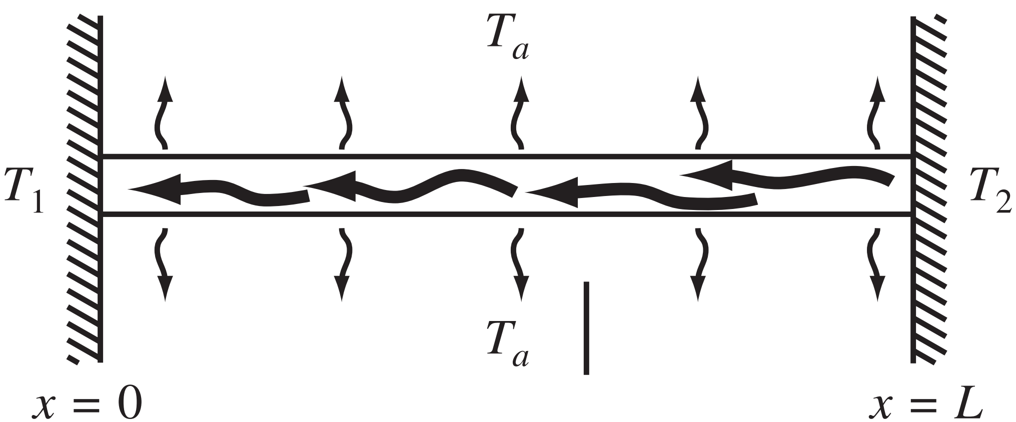


$$\begin{cases} \dfrac{dz}{dx} = h'\left(T - T_a\right) \\ \dfrac{dT}{dx} = z \end{cases}$$

- Este problema corresponde a uno de frontera.
- Conozco el valor de la variable independiente en diferentes puntos.
- ¡Conozco T(0) y T(L)!

El método de disparo se basa en convertir el problema de valor en la frontera en un problema de valor inicial equivalente. Posteriormente se aplica un procedimiento de prueba y error para resolver la versión del valor inicial.

Shooting Method



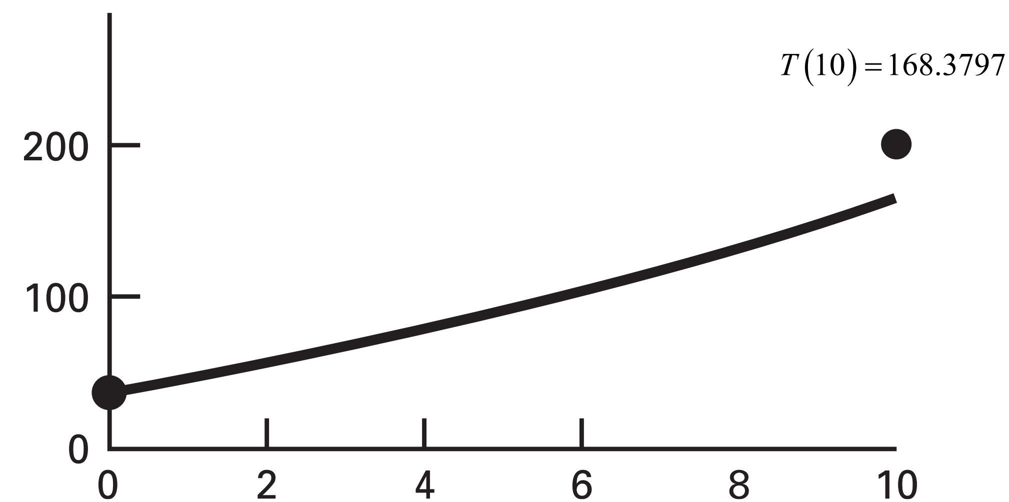
$$\begin{cases} \dfrac{dz}{dx} = h'\left(T - T_a\right) \\ \dfrac{dT}{dx} = z \end{cases}$$

$z(0) = 10$

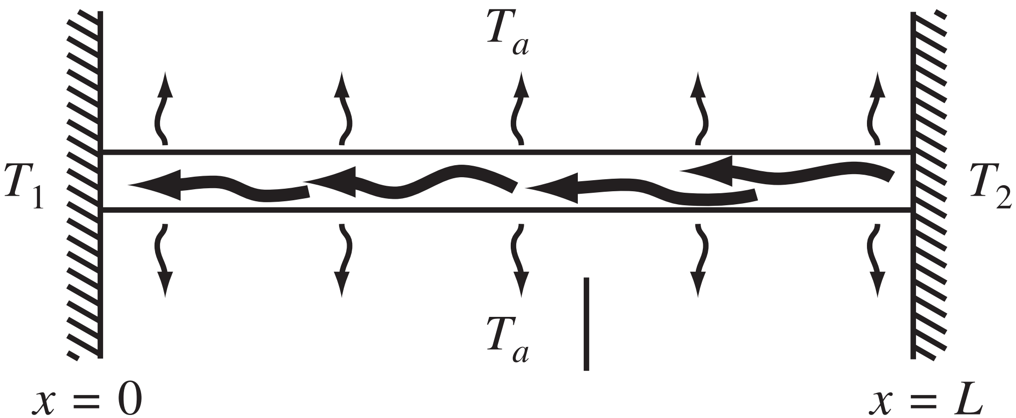
$T(0) = 40$

$RK4$

$\Delta x = 2$



Shooting Method



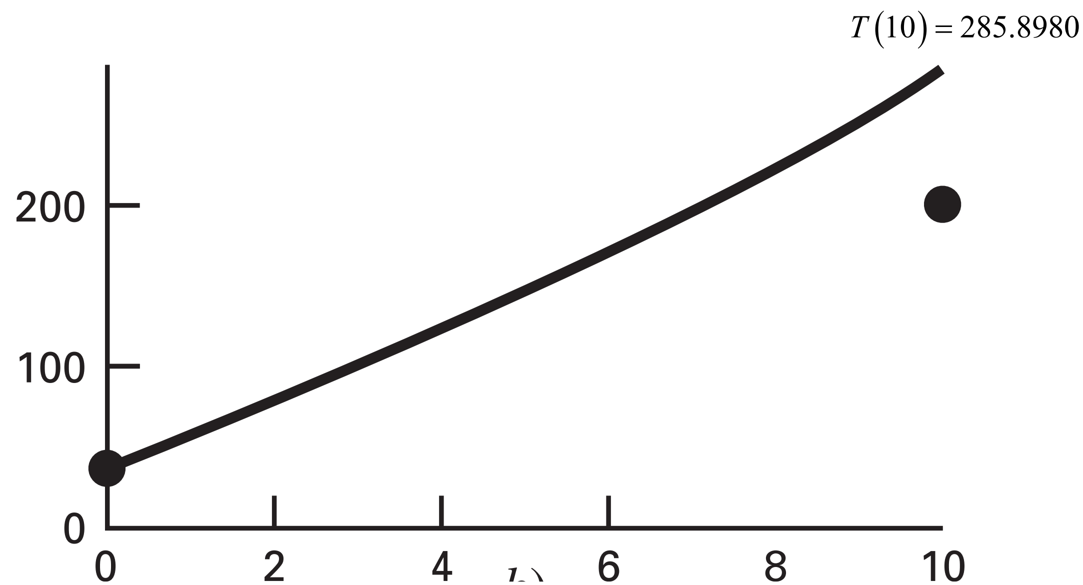
$$
\begin{cases}
\dfrac{dz}{dx} = h'\left(T - T_a\right) \\
\dfrac{dT}{dx} = z
\end{cases}
$$

$z(0) = 20$

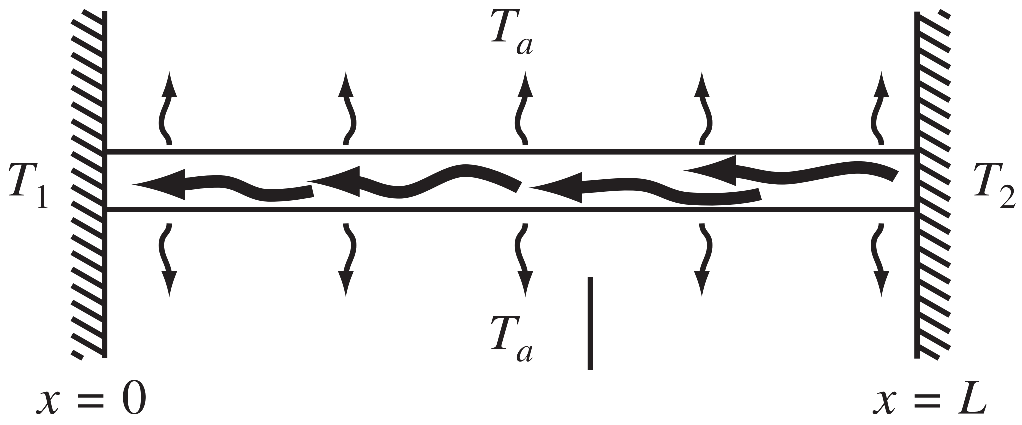
$T(0) = 40$

$RK4$

$\Delta x = 2$



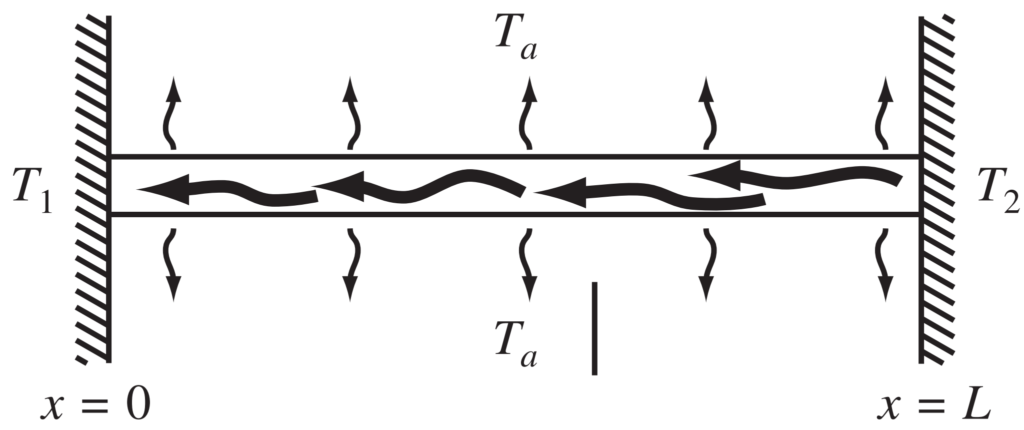
Shooting Method



$$\begin{cases} \dfrac{dz}{dx} = h'(T - T_a) \\ \dfrac{dT}{dx} = z \end{cases}$$

z(0)	T(10)	T(10)-200
10	168.3797	-31.6203
20	285.898	85.898
12.6907		

secante



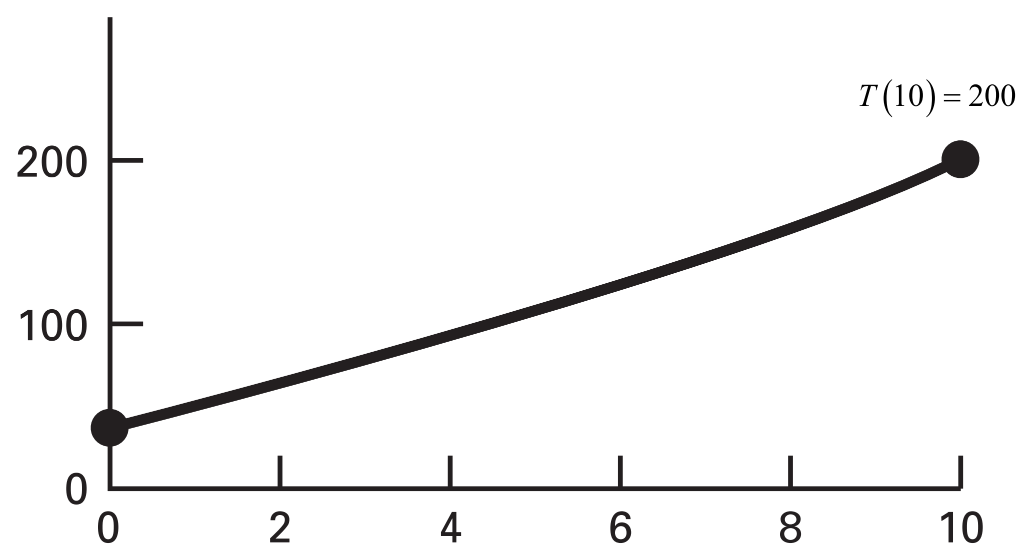
$$\begin{cases} \dfrac{dz}{dx} = h'(T - T_a) \\ \dfrac{dT}{dx} = z \end{cases}$$

$\boxed{z(0) = 12.6907}$ secante

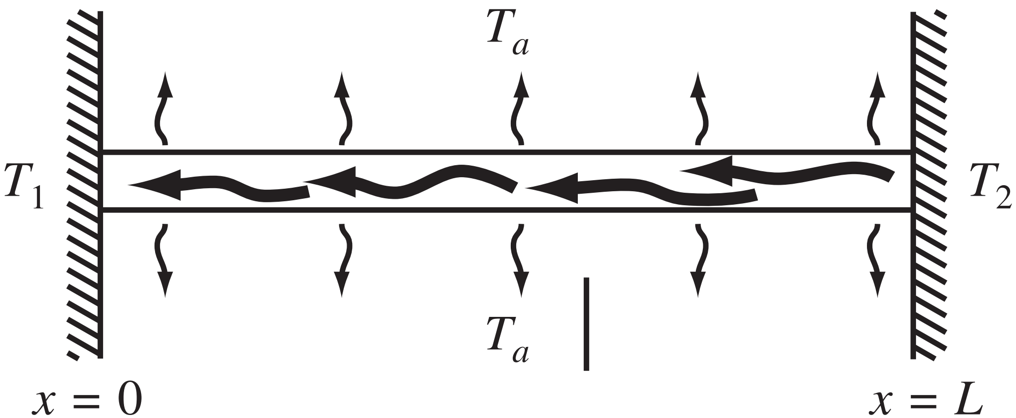
$T(0) = 40$

$RK4$

$\Delta x = 2$



Shooting Method



$$T_a = 20^\circ C$$
$$T_1 = 40^\circ C$$
$$T_2 = 200^\circ C$$
$$h'' = 5\times 10^{-8}$$
$$L = 10$$

Radiación

$$\frac{d^2T}{dx^2} + h''\left(T_a - T\right)^4 = 0$$

$$\begin{cases} \dfrac{dz}{dx} = h''\left(T_a - T\right)^4 \\ \dfrac{dT}{dx} = z \end{cases}$$

Euler

$$\Delta x = 0.5$$

z(0)	T(10)	T(10)-200
10	191.520128	-8.47987205
12	266.40158	66.4015799
10.2265	198.223071	-1.77692924
10.2727	199.634849	-0.36515079
10.2847	200.002504	0.00250448
10.2846	199.999996	-3.5076E-06

Shooting Method

i	x	T	z	T'	z'
0	0	40	**10.2845847**	10.2845847	0.008
1	0.5	45.1422923	10.2885847	10.2885847	0.01997972
2	1	50.2865847	10.2985746	10.2985746	0.04206987
3	1.5	55.435872	10.3196095	10.3196095	0.07883925
4	2	60.5956767	10.3590291	10.3590291	0.13579668
5	2.5	65.7751913	10.4269275	10.4269275	0.21952838
6	3	70.988655	10.5366916	10.5366916	0.33795917
7	3.5	76.2570008	10.7056712	10.7056712	0.50081382
8	4	81.6098364	10.9560781	10.9560781	0.72039423
9	4.5	87.0878755	11.3162753	11.3162753	1.0128524
10	5	92.7460131	11.8227015	11.8227015	1.4002539
11	5.5	98.6573639	12.5228284	12.5228284	1.91393663
12	6	104.918778	13.4797967	13.4797967	2.60006945
13	6.5	111.658676	14.7798314	14.7798314	3.52910297
14	7	119.048592	16.5443829	16.5443829	4.81241677
15	7.5	127.320784	18.9505913	18.9505913	6.63292893
16	8	136.796079	22.2670558	22.2670558	9.3042862
17	8.5	147.929607	26.9191989	26.9191989	13.3922722
18	9	161.389207	33.615335	33.615335	19.9818196
19	9.5	178.196874	43.6062448	43.6062448	31.3156619
20	10	**199.999996**	59.2640758	59.2640758	52.4879959