

Solution of 1D parabolic partial differential equation

Stokes first problem-explicit method

Model problem:

$$T_t := T_{yy}$$

$$\underline{m} := 5 \quad \underline{L} := 5 \quad n := 20 \quad T_i := 1$$

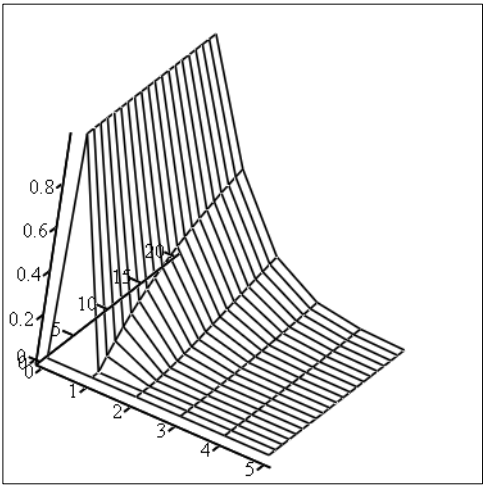
$$f(r) := 0 \quad r3 := 1 - 2 \cdot \frac{\frac{T_i}{n}}{\left(\frac{L}{m}\right)^2} \quad r3 = 0.9$$

$$\text{Stokes}(f, L, T_i, n, m) := \left| \begin{array}{l} dy \leftarrow \frac{L}{m} \\ dt \leftarrow \frac{T_i}{n} \\ r3 \leftarrow 1 - 2 \cdot \frac{dt}{dy^2} \\ r1 \leftarrow \frac{dt}{dy^2} \\ r2 \leftarrow \frac{dt}{dy^2} \\ \text{for } i \in 0..m \\ \quad y_i \leftarrow dy \cdot i \\ \text{for } j \in 0..n \\ \quad t_j \leftarrow dt \cdot j \\ \text{for } i \in 0..m \\ \quad T_{i,0} \leftarrow f(y_i) \\ \text{for } j \in 0..n-1 \\ \quad \left| \begin{array}{l} \text{for } i \in 1..m-1 \\ \quad T_{i,j+1} \leftarrow r3 \cdot T_{i,j} + r1 \cdot T_{i+1,j} + r2 \cdot T_{i-1,j} \\ T_{0,j+1} \leftarrow 1 \\ T_{m,j+1} \leftarrow 0 \end{array} \right. \end{array} \right| T^T$$

Velocity := Stokes(f,L,Ti,n,m)

Velocity =

	0	1	2	3	4	5
0	0	0	0	0	0	0
1	1	0	0	0	0	0
2	1	0.05	0	0	0	0
3	1	0.095	$2.5 \cdot 10^{-3}$	0	0	0
4	1	0.136	$7 \cdot 10^{-3}$	$1.25 \cdot 10^{-4}$	0	0
5	1	0.172	0.013	$4.625 \cdot 10^{-4}$	$6.25 \cdot 10^{-6}$	0
6	1	0.206	0.02	$1.071 \cdot 10^{-3}$	$2.875 \cdot 10^{-5}$	0
7	1	0.236	0.029	$1.986 \cdot 10^{-3}$	$7.942 \cdot 10^{-5}$	0
8	1	0.264	0.038	$3.228 \cdot 10^{-3}$	$1.708 \cdot 10^{-4}$	0
9	1	0.29	0.047	$4.802 \cdot 10^{-3}$	$3.151 \cdot 10^{-4}$	0
10	1	0.313	0.057	$6.705 \cdot 10^{-3}$	$5.237 \cdot 10^{-4}$	0
11	1	0.335	0.068	$8.928 \cdot 10^{-3}$	$8.066 \cdot 10^{-4}$	0
12	1	0.354	0.078	0.011	$1.172 \cdot 10^{-3}$	0
13	1	0.373	0.088	0.014	$1.628 \cdot 10^{-3}$	0
14	1	0.39	0.099	0.017	$2.178 \cdot 10^{-3}$	0
15	1	0.406	0.109	0.021	$2.828 \cdot 10^{-3}$	0



Velocity