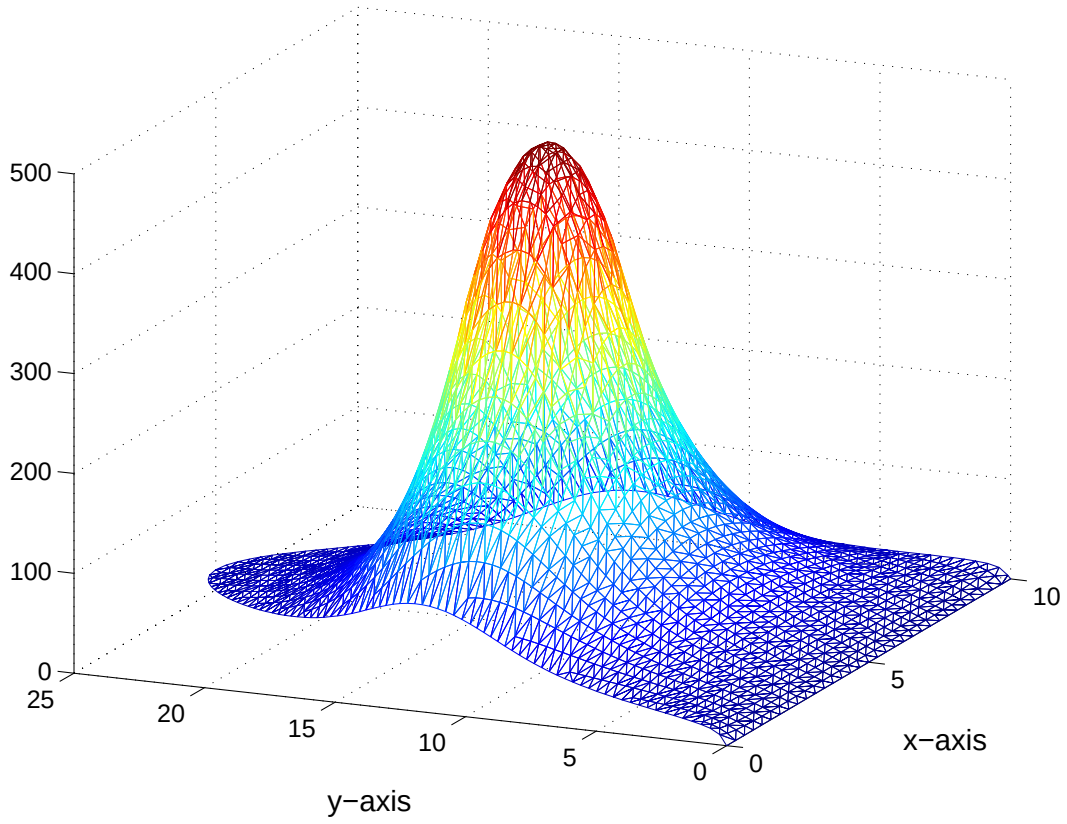
This surface (pictured below with axes and grid), is also the surface appearing (in black and white) on the cover of the book: *Introduction to Numerical Ordinary and Partial Differential Equations Using MATLAB®*. Read on below the figure to see its physical significance as well as an outline of how it was created.

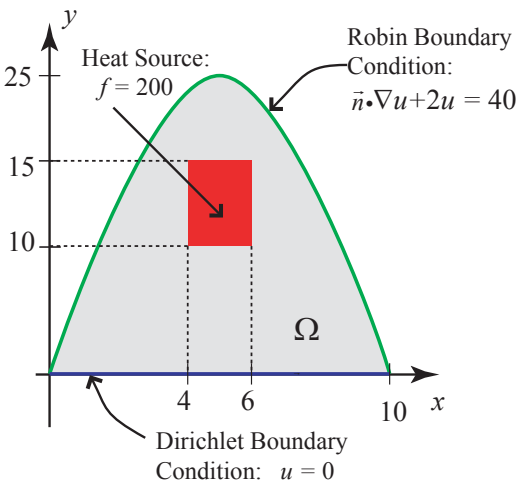


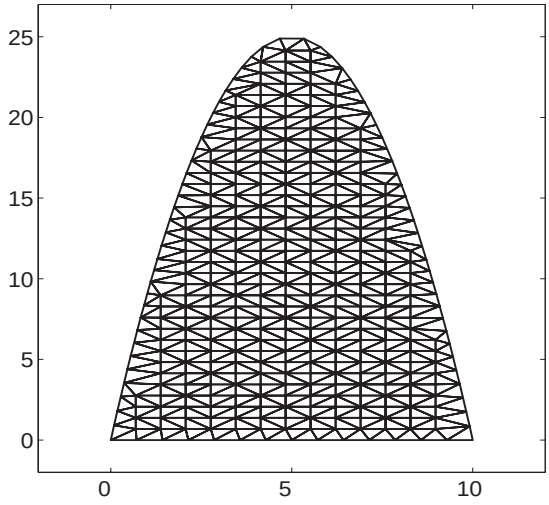
The surface represents the finite element method numerical solution of the following steady-state heat distribution problem on the parabolic region $\Omega = \{(x, y) : 0 \le x \le 10,\ 0 \le y \le x(x-10)\}$:

$$\begin{cases} \text{(PDE)} & -\Delta u = f & \text{on } \Omega \\ \text{(BCs)} & u = 0 & \text{on } x\text{-axis} \\ & \vec{n} \bullet \nabla u + 2u = 40 & \text{on } y = x(10-x) \end{cases},$$

where the heat source function is given by: $f(x, y) = \begin{cases} 200, & \text{if } 4 \le x \le 6 \text{ and } 10 \le y \le 15 \\ 0, & \text{otherwise.} \end{cases}$

Higher z-values of the solution represent hotter temperatures, and are shown in red; the lower z-values are indicated by blue color. The boundary conditions are illustrated in the left-side figure on the next page, and the triangulation of the domain Ω is shown on the right-side. All the necessary procedures and MATLAB codes (including the mesh generation, computation of the finite element method solution, and the plot) are provided in Section 13.3 of the book.


y
25
15
10
Heat Source:
f = 200
Robin Boundary
Condition:
n•∇u+2u = 40
Ω
4
6
10
x
Dirichlet Boundary
Condition: u = 0


25
20
15
10
5
0
0
5
10