Chapter 16 Figures 27 To 38 From

MATHEMATICAL METHODS for Scientists and Engineers

Donald A. McQuarrie

For the Novice Acrobat User or the Forgetful

When you opened this file you should have seen a slightly modified cover of the book *Mathematical Methods for Scientists and Engineers* by Donald A. McQuarrie, a menu bar at the top, some index markers at the left hand margin, and a scroll bar at the right margin.

Select the **View** menu item in the top menu and be sure **Fit in Window** and **Single Page** are selected. Select the **Window** menu item and be sure **Bookmarks** and **Thumbnails** ARE NOT selected.

You can and probably should make the top menu bar disappear by pressing the function key F9. Pressing this key (F9) again just toggles the menu bar back on. You may see another tool bar that is controlled by function key F8. Press function key F8 until the tool bar disappears.

In the upper right hand corner margin of the window containing this text you should see a few small boxes. DO NOT move your mouse to the box on the extreme right and click in it; your window will disappear! Move your mouse to the second box from the right and click (or left click); the window containing this text should enlarge to fill the screen. Clicking again in this box will shrink the window; clicking again will return the display to full screen.

The prefered means of navigation to any desired figure is controlled by the scroll bar in the column at the extreme right of the screen image. Move your mouse over the scroll bar slider, click, and hold the mouse button down. A small window will appear with the text "README (2 of 14)". Continuing to hold down the mouse button and dragging the button down will change the text in the small window to something like "16.30 (6 of 14)". Releasing the mouse button at this point moves you to Figure 16.30 of Chapter 16. The (6 of 14) indicates that Figure 16.30 resides on page 6 of the 14 pages of this document.

ANIMATIONS

Figures 16.30, 16.32, 16.34, and 16.35 each has an associated animation that requires QuickTime™ for display. The names of the animation files are Anim16_30.mov, Anim16_32.mov, Anim16_34.mov, and Anim16_35.mov, respectively. Each of the animations must be independently downloaded from the server.

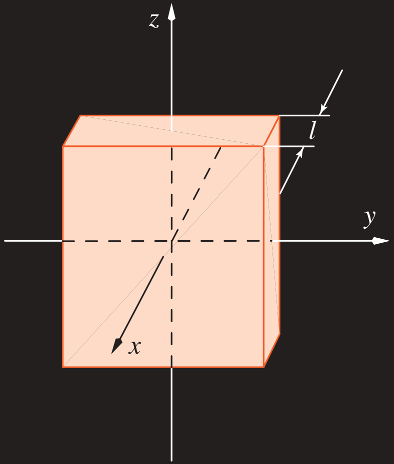

Figure 16.27
A slab of uniform material of thickness l.

Figure 16.28
A thin homogeneous wire of length l that is insulated along its lateral surface so that the temperature varies only in the x direction.

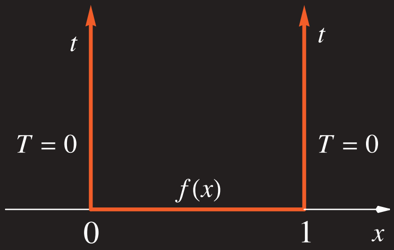

Figure 16.29
A summary of the boundary coditions and the initial conditions for Equations 1 and 2.

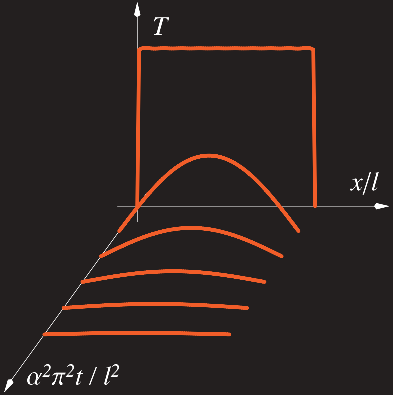

Figure 16.30
The solution to the equations in Example 1 plotted against x for several values of $t = \alpha^2\pi^2 t / l^2$.

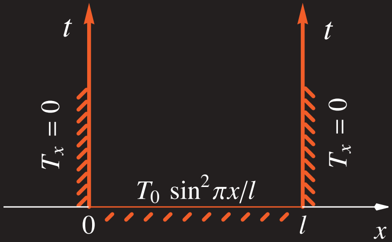

Figure 16.31
A summary of the boundary conditions and the initial condition for Example 2.

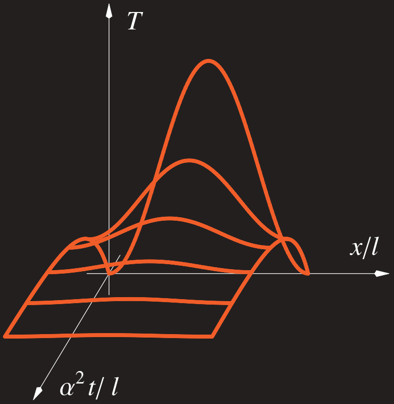

Figure 16.32
The solutions to the equations in Example 2 plotted against x/l for various values of $t = 4\pi^2\kappa t/l^2$.

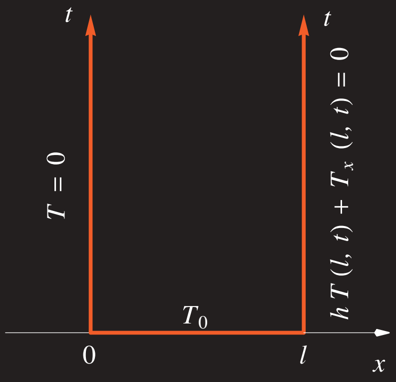

Figure 16.33
A summary of the boundary conditions and the initial condition for Example 3.

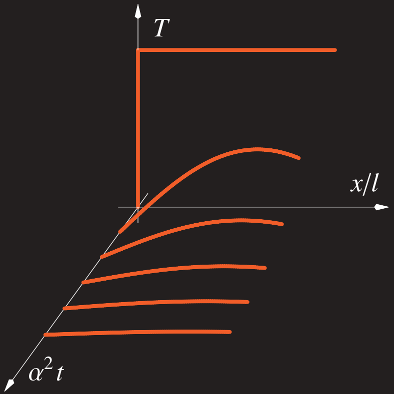

Figure 16.34

The solution in Example 3 plotted against x for various values of $\alpha^2 t$ for $h = l = 1$.

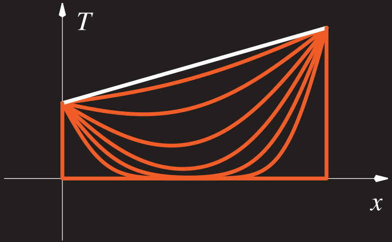

Figure 16.35

The time evolution of the solution given in Example 4, showing how $T(x, t)$ aproaches the steady-state solution $s(x) = 1 + x$ (white).

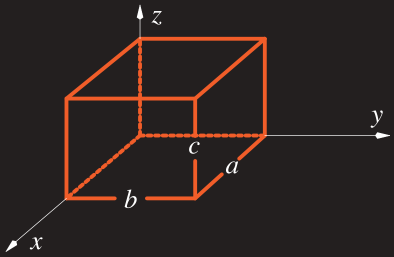

Figure 16.36
A rectangular parallelepiped of sides a, b, and c. In the quantum-mechanical problem of a particle in a box, the particle is restricted to lie within a potential-free parallelepiped.

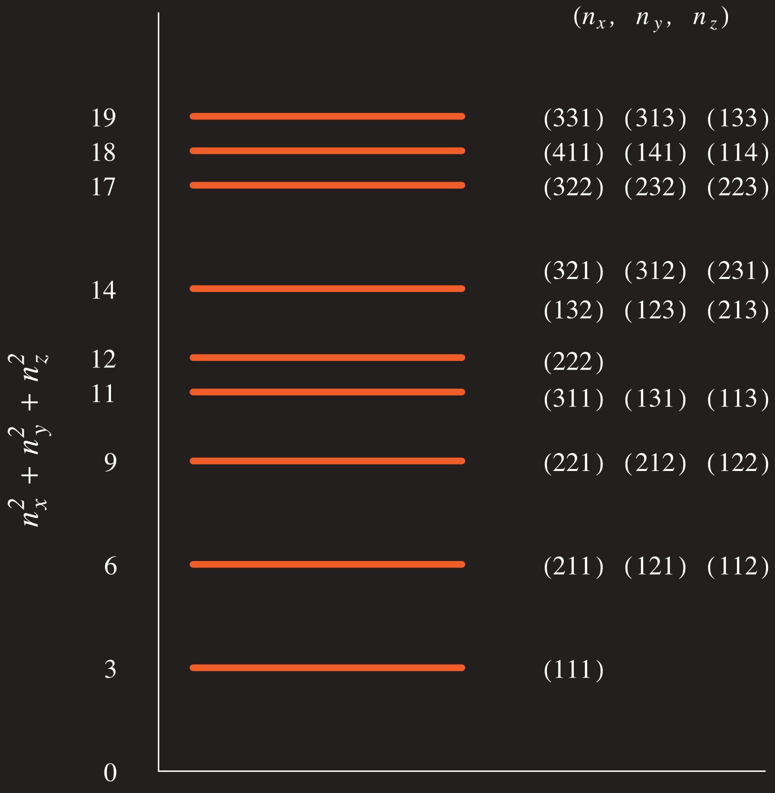

Figure 16.37
The allowed energy levels for a particle in a box with $a = b = c$.

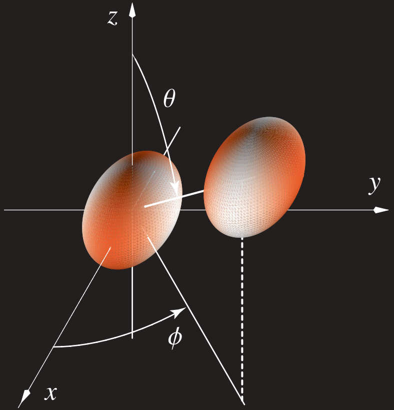

Figure 16.38
The model of a rigid rotator. We can choose our coordinate system so that one of the masses sits at the origin and the other takes on a reduced mass $\mu = m_1 m_2/(m_1 + m_2)$.