Chapter 17 Figures 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 26)". Continuing to hold down the mouse button and dragging the button down will change the text in the small window to something like "17.4 (6 of 26)". Releasing the mouse button at this point moves you to Figure 17.4 of Chapter 17. The (6 of 26) indicates that Figure 17.4 resides on page 6 of the 26 pages of this document.

ANIMATIONS

Figures 17.14, 17.15, 17.16, 17.17, 17.18, 17.19, 17.22, and 17.23 each has an associated animation that requires QuickTime™ for display. The names of the animation files are Anim17_14.mov, Anim17_15.mov, Anim17_16.mov, Anim17_17.mov, Anim17_18.mov, Anim17_19.mov, Anim17_22.mov, and Anim17_23.mov, respectively. The animation files must each be independently acquired from the server.

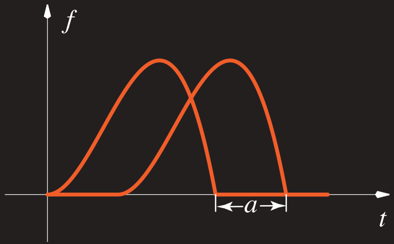

Figure 17.1
A function $f(t)$ and $f(t - a)$ plotted against t. Note that $f(t - a)$ is simply $f(t)$ shifted to the right by a units.

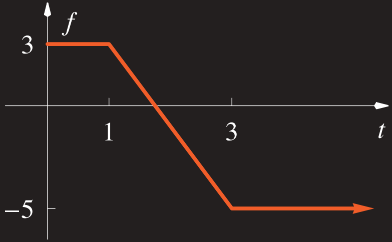

Figure 17.2
The function $f(t) = 3 - 4(t - 1)H(t - 1) + 4(t - 3)H(t - 3)$ in Example 4 plotted against t.

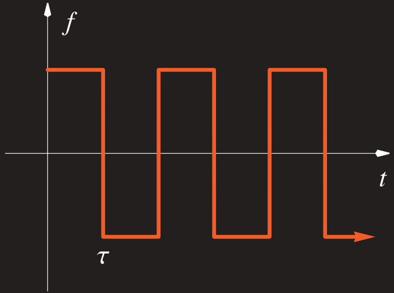

Figure17.3
The periodic square wave described in Example 5.

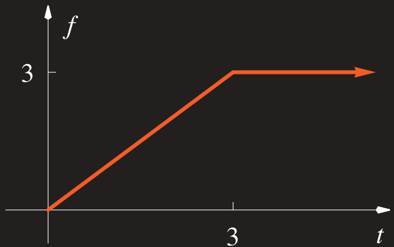

Figure 17.4

The solution to Example 4, $f(t) = t - (t - 3)H(t - 3)$, plotted against t.

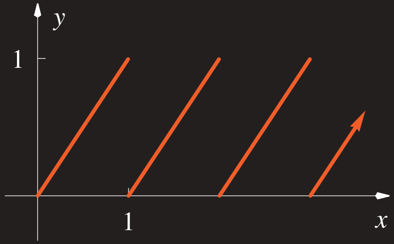

Figure 17.5
The function $f(t) = t - H(t-1) - H(t-2) - H(t-3) + \cdots$ plotted against t.

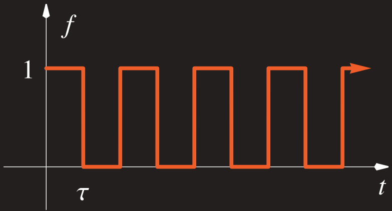

Figure 17.6
The function $f(t)$ defined in Example 5.

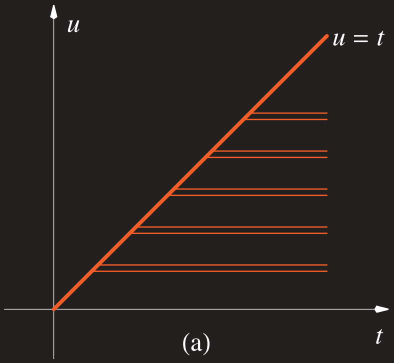

Figure 17.7
A pictorial aid to interchanging the orders of integration in Equation 10. (a) We integrate over t from u to ∞ first, and then add up all the horizontal strips as u goes from 0 to ∞. (b) We integrate over u from 0 to t first, and then add up all the vertical strips. The two process cover the same area of the ut-diagram.

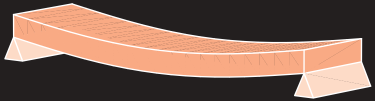

Figure 17.8
A uniform beam supported at its ends and under an applied load.

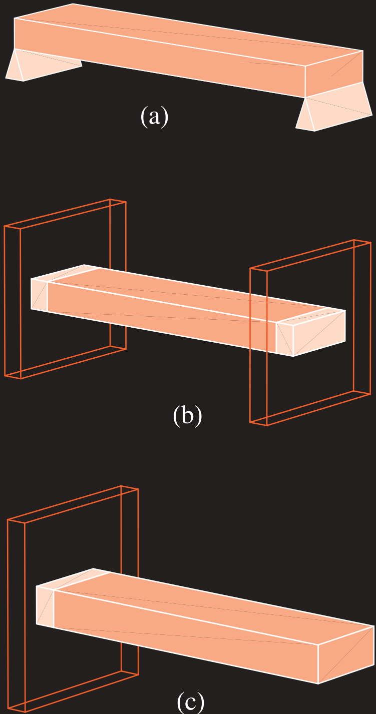

Figure 17.9
An illustration of the typical boundary conditions associated with the calculation of the deflection of a uniform beam. (a) The ends are supported; (b) the ends are clamped, as imbedded in a support; and (c) one end is clamped and the other end is free.

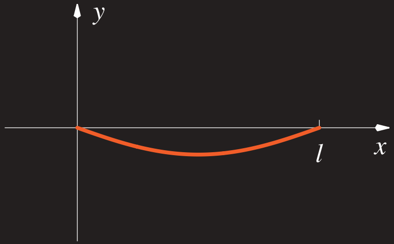

Figure 17.10
The deflection of a uniform beam supported at its two ends under a uniform load w.

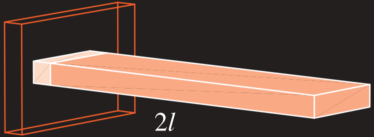

Figure 17.11
A beam of length $2l$ that is clamped at its left end and free at its right end.

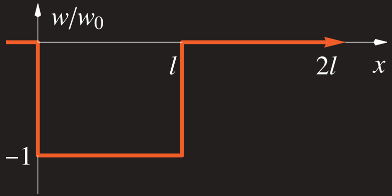

Figure 17.12
A plot of the load $w(x) = w_0[H(x) - H(x - l)]$ that occurs in Example 5.

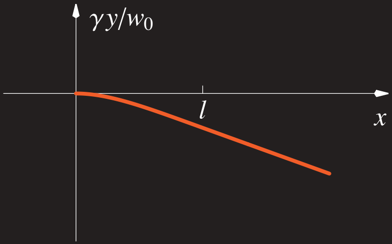

Figure 17.13
The deflection of the beam described in Example 5.

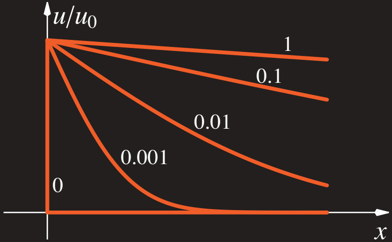

Figure 17.14
A plot of $u(x, t) = u_0 \operatorname{erfc}[x/(4\alpha^2 t)^{1/2}]$ against x for various values of t.

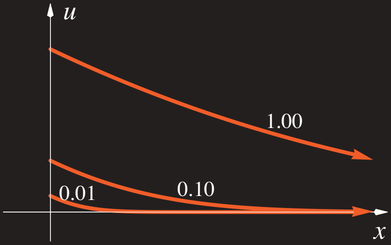

Figure 17.15

The solution given in Example 2 plotted against x for various values of $4\alpha^2 t$.

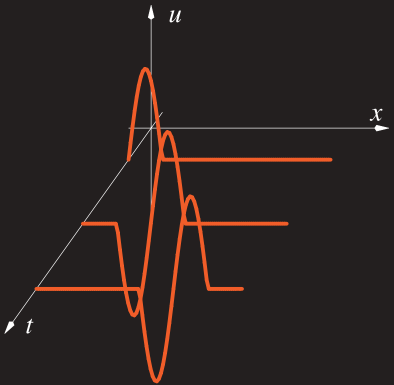

Figure 17.16
The waveform propagated along a string according to Example 4.

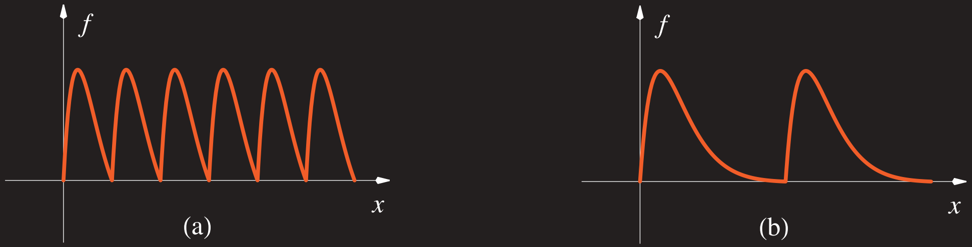

Figure 17.17
A periodic function as the period gets longer and longer.

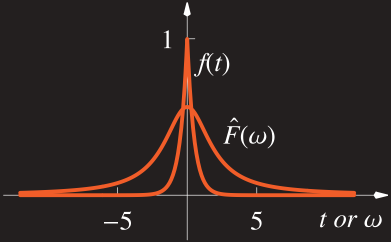

Figure 17.18
The Fourier transform pair (a) $f(t) = e^{-\alpha|t|}$ and (b) $\hat{F}(\omega) = \alpha(2/\pi)^{1/2}/(\omega^2 + \alpha^2)$.

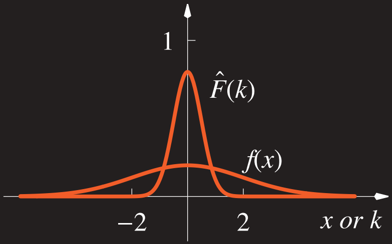

Figure 17.19
The Fourier transform pair (a) $f(x) = (2\pi\sigma^2)^{-1/2}\exp(-x^2/2\sigma^2)$ and (b) $\hat{F}(k) = (\sigma 2/2\pi)^{1/2}\exp(-\sigma^2 k^2/2)$.

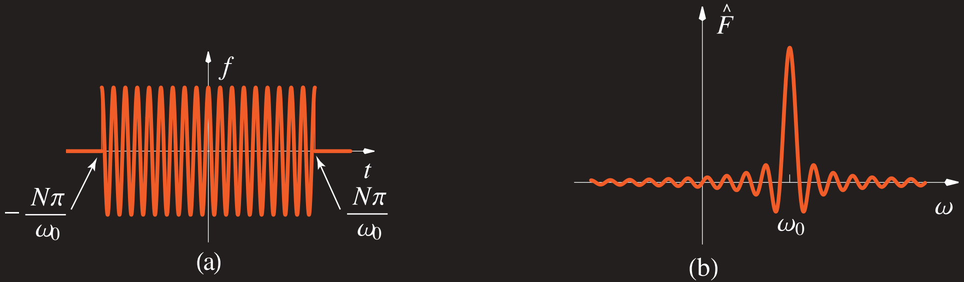

Figure 17.20
The Fourier Transform pair (a) $f(t)$ and (b) $\hat{F}(\omega)$ given in Example 2.

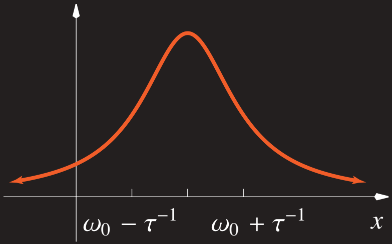

Figure 17.21
The frequency spectrum associated with the radiated wave described in Example 7 for $\omega_0 = 20$ and $\tau = 1$.

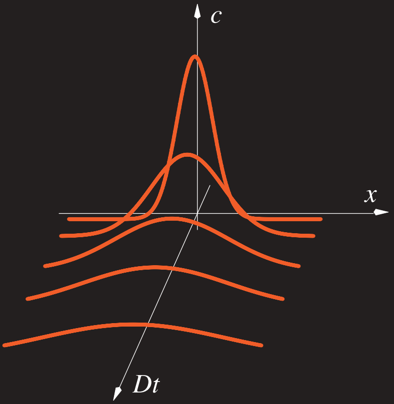

Figure 17.22
The fundamental solution of the one-dimensional diffusion equation plotted against x for increasing values of Dt.

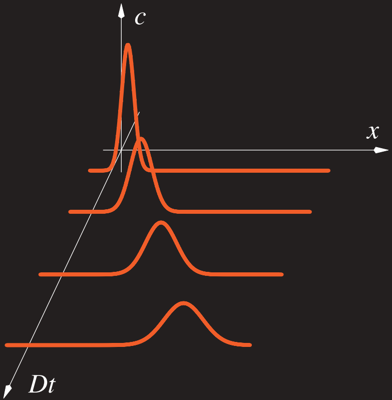

Figure 17.23
The fundamental solution of the one-dimensional diffusion equation with a constant drift term plotted against x for increasing values of Dt for $\mu/D = 1.5$.

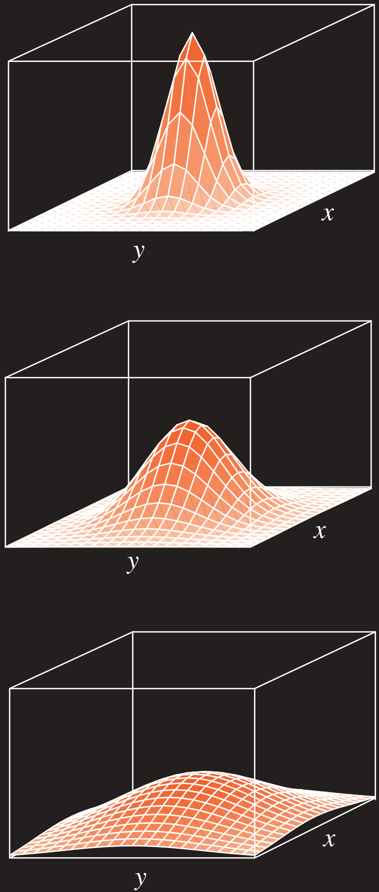

Figure 17.24
The fundamental solution of the two-dimensional diffusion equation plotted against r for increasing values of Dt.