Chapter 3 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 34)". Continuing to hold down the mouse button and dragging the button down will change the text in the small window to something like "3.4 (6 of 34)". Releasing the mouse button at this point moves you to Figure 3.4 of Chapter 3. The (6 of 34) indicates that Figure 3.4 resides on page 6 of the 34 pages of this document.

ANIMATIONS

Figures 3.8, 3.9, 3.24, 3.25, and 3.26 have associated animations that require QuickTime™ for display. These animations are named Anim3_8.mov, Anim3_9.mov, Anim3_24.mov, Anim3_25, and Anim3_26.mov, respectively, and must be independently acquired from the server.

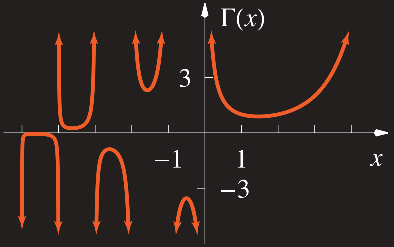

Figure 3.1
The gamma function Γ(x) plotted against x.

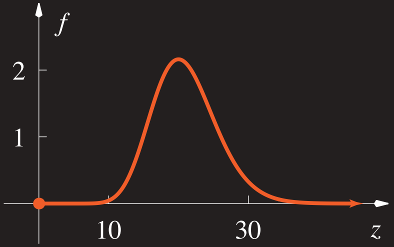

Figure 3.2
The function $f(z) = e^{x \ln z - z}$, which is the integrand of Equation 9, plotted against z for $x = 20$.

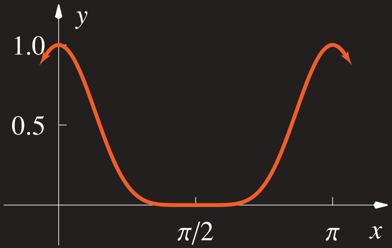

Figure 3.3
The function $y(\theta) = \cos^6\theta$ is symmetric about $\theta = \pi/2$.

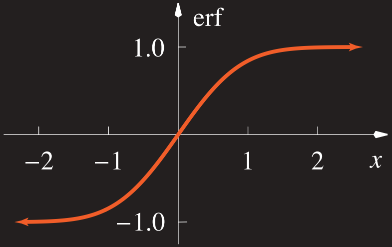

Figure 3.4
The error function erf(x) plotted against x.

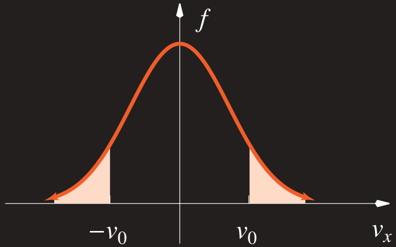

Figure 3.5
The shaded area represents the fraction of molecules in a gas with an x-component of the velocity that exceeds some value v_0 in magnitude.

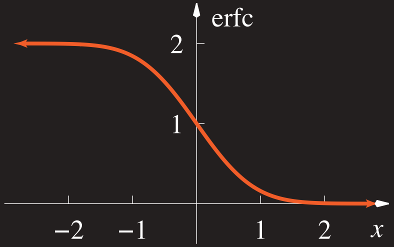

Figure 3.6
The complementry error function erfc(x) plotted against x.

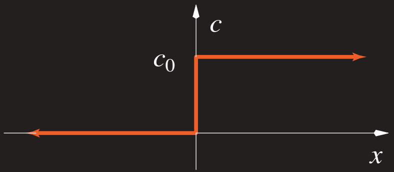

Figure 3.7
The initial concentration profile $c(x) = 0$ for $x < 0$ and $c(x) = c_0$ for $x > 0$ in a long cylindrical tube.

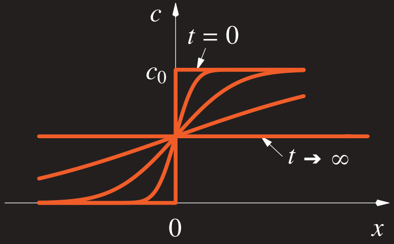

Figure 3.8

The concentration profiles in a long cylindrical tube, where the initial concentration profile was $c(x) = 0$ for $x < 0$ and $c(x) = c_0$ for $x > 0$.

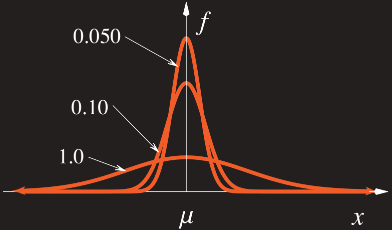

Figure 3.9
The Gaussian distribution, Equation 5, plotted against x for $\sigma = 1.0, 0.10$, and 0.050.

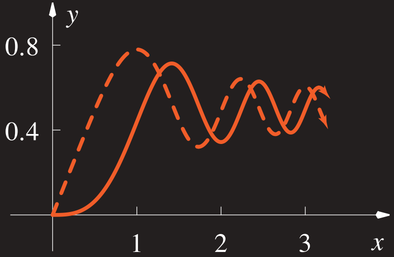

Figure 3.10
The Fresnel sine integral, $S(x)$, defined by Equation 12 (solid) and the Fresnel cosine integral, $C(x)$, defined by Equation 13 (dashed) plotted against x.

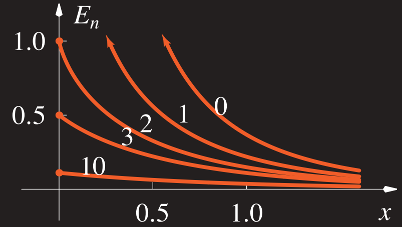

Figure 3.11
The functions $E_n(x)$ defined by Equation 1 plotted against x.

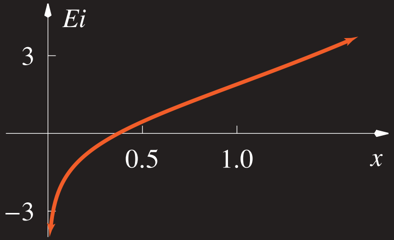

Figure 3.12
The function $Ei(x)$ defined by Equation 5 plotted against x.

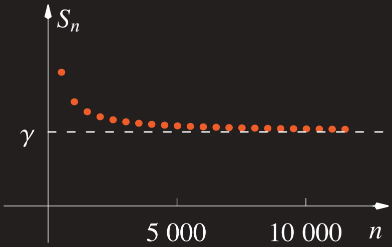

Figure 3.13
The function $\sum_{k=1}^{n} \frac{1}{k} - \ln n$ plotted against n. The limiting value is equal to Euler's constant.

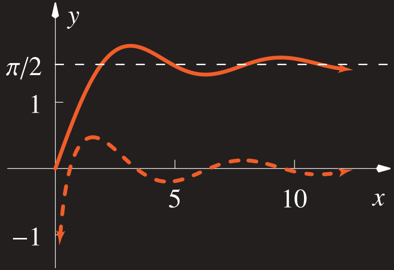

Figure 3.14
The sine integral, $Si(x)$ (solid), defined by Equation 11, and the cosine integral, $Ci(x)$ (dashed), defined by Equation 12, plotted against x.

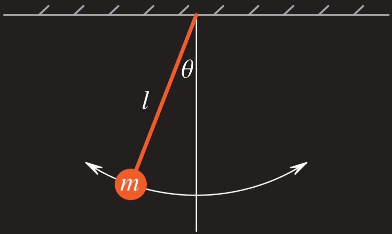

Figure 3.15

The geometry of the pendulum discussed in Equations 1 through 6.

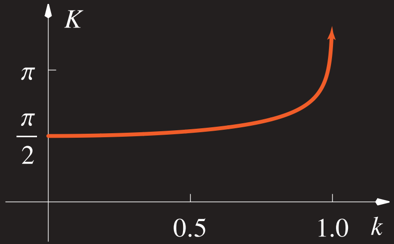

Figure 3.16
The complete elliptic integral of the first kind, $K(k)$, defined by Equation 7, plotted against k.

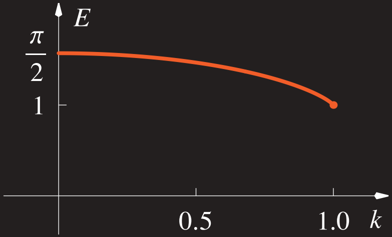

Figure 3.17
The complete elliptic integral of the second kind, $E(k)$, defined by Equation 9, plotted against k.

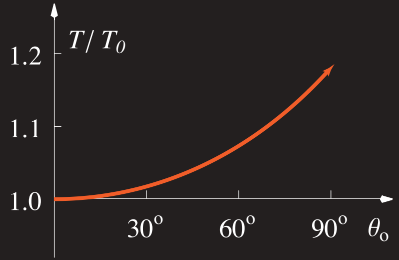

Figure 3.18
The ratio of the periods of a general oscillator and a harmonic oscillator plotted against θ_0, the initial angle in Figure 3.15.

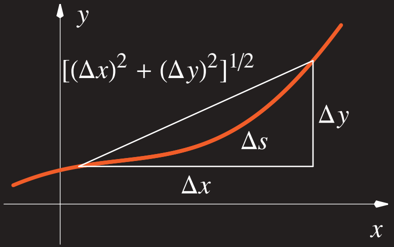

Figure 3.19
The geometry associated with the calculation of arc length.

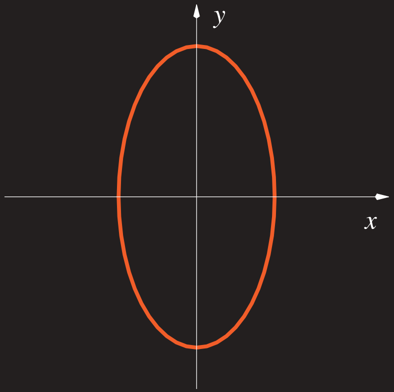

Figure 3.20
An ellipse with the major axis along the y axis.

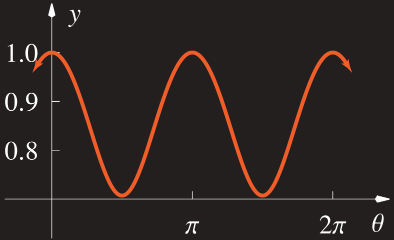

Figure 3.21
An illustration of the fact that $y(\theta) = (1 - k^2 \sin^2 \theta)^{1/2}$ is periodic with a period π. In this figure, $k^2 = 0.50$.

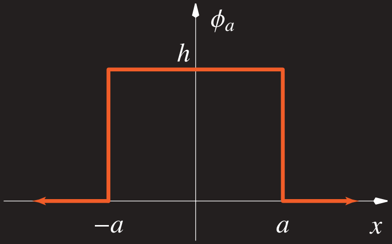

Figure 3.22
The function ϕ_a defined by Equation 1 plotted against x.

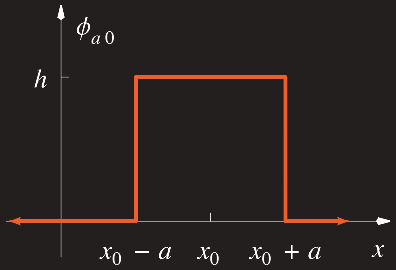

Figure 3.23
The function $\phi_{a0}(x)$ defined by Equation 4 plotted against x .

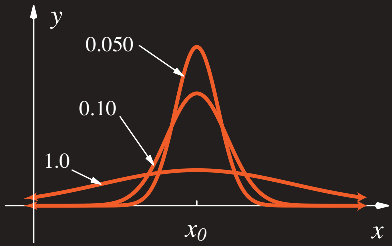

Figure 3.24

The Gaussian distribution in Equation 9 plotted against x for σ = 1.0, 0.10, and 0.050 (see Figure 3.9)

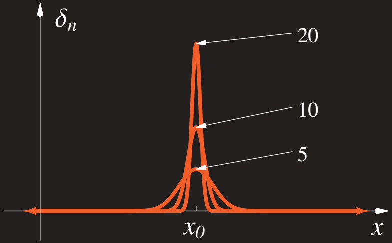

Figure 3.25
The delta sequence in Equation 11 plotted against x for n = 5, 10, and 20.

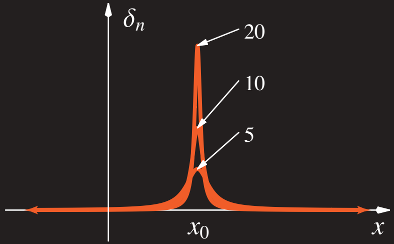

Figure 3.26

The delta sequence in Equation 14 plotted against x for $n =$ 5, 10, and 20.

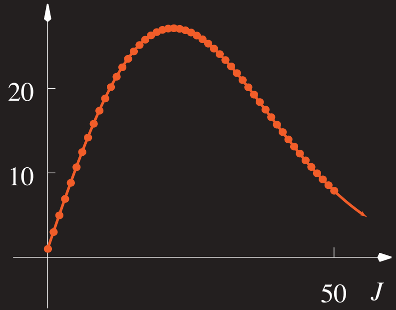

Figure 3.27
The terms of the series in Equation 12 and the continuous function $(2J + 1)\ e^{-\alpha J(J+1)}$ plotted against J for $\alpha = 0.001$.