Chapter 18 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 37)". Continuing to hold down the mouse button and dragging the button down will change the text in the small window to something like "18.4 (6 of 37)". Releasing the mouse button at this point moves you to Figure 18.4 of Chapter 18. The (6 of 37) indicates that Figure 18.4 resides on page 6 of the 37 pages of this document.

ANIMATIONS

There are no animations in this chapter at this time.

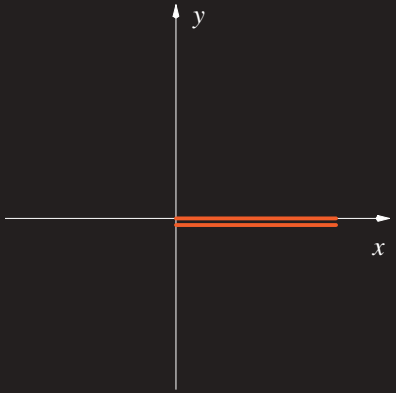

Figure 18.1
An illustration of a branch cut along the positive x axis for the function $f(z) = z^{1/2}$.

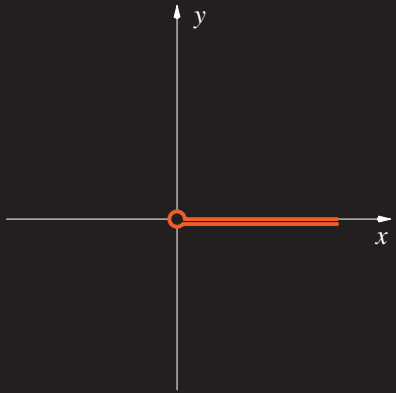

Figure 18.2
A branch cut along the positive x axis for $f(z) = \ln z$ and a branch point at the origin.

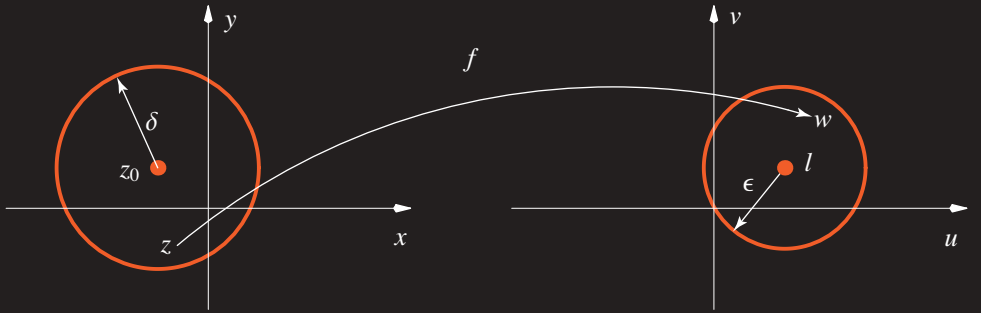

Figure 18.3
An illustration of the limit of a function $f(z)$ in the complex plane. (a) The point z lies within a δ neighborhood of z_0. (b) The point $w = f(z)$ is lies within an ϵ neighborhood of l.

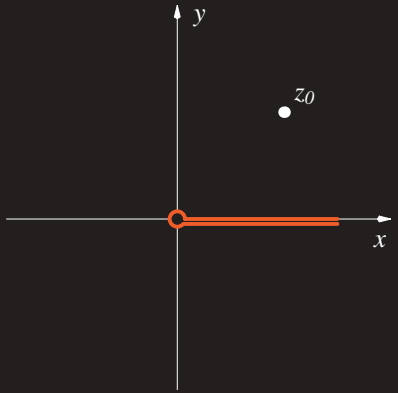

Figure 18.4
An illustration that $z_0 \neq 0$ is not a branch point of ln z, but $z_0 = 0$ is.

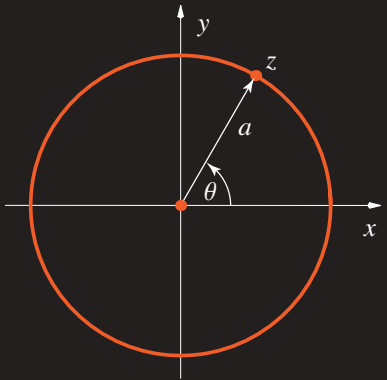

Figure 18.5
A pictorial aid to Example 5.

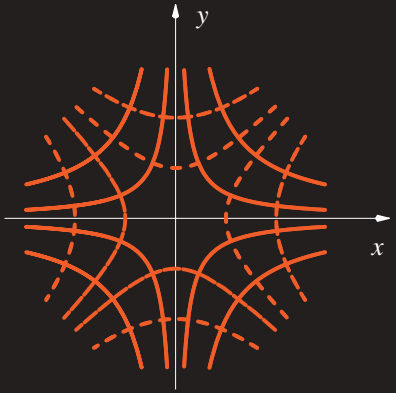

Figure 18.6
The families of curves $u(x, y) = x^2 - y^2 = c_1$ (dashed) and $v(x, y) = 2xy = c_2$ (solid), showing that they are orthogonal.

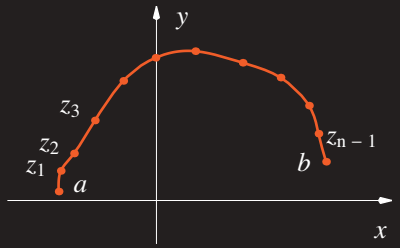

Figure 18.7
The subdivision of a path from a to b in the complex plane subdivided into n segments.

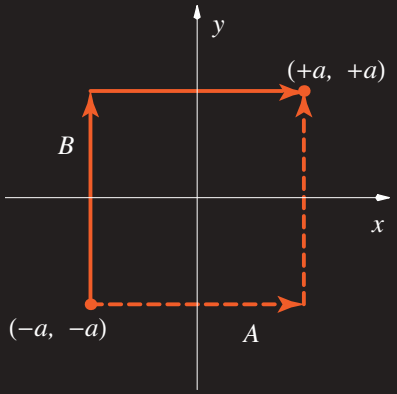

Figure 18.8
Two different paths along which to integrate $f(z) = \cos z$.

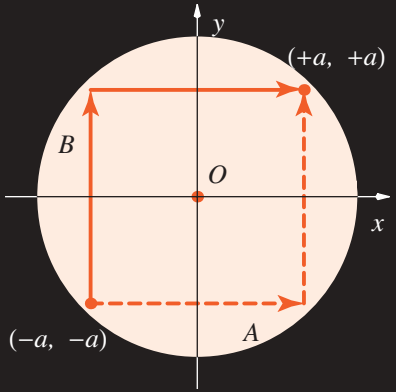

Figure 18.9
A region in which the two paths in Figure 18.8 lie.

Figure 18.10
An example of (a) a simple, closed curve and (b) one that is not.

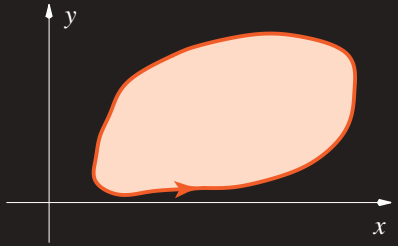

Figure 18.11
An illustration of z traversing in a positive sense around a closed curve. The region bounded by the closed curve always lies to the left as z advances.

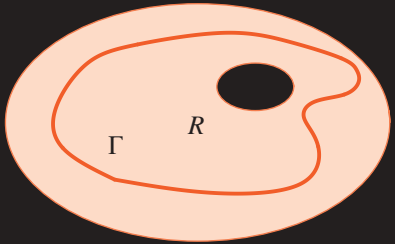

Figure 18.12
An example of a multiply-connected region.

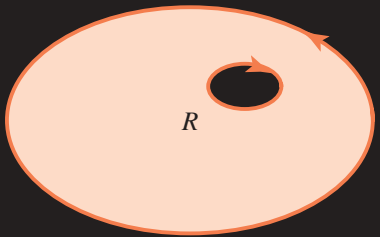

Figure 18.13
An indication of the positive direction of the traverset of the boundary of a multiply-connected region. Once again, the region always lies to the left as z advances.

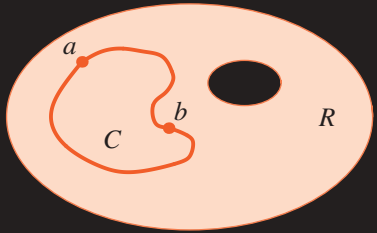

Figure 18.14
An illustration to aid in the proof of Equation 10.

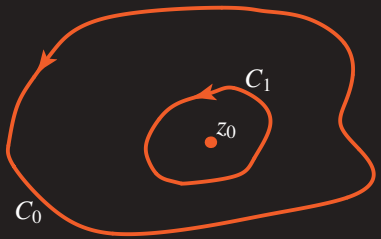

Figure 18.15
Two simple closed curves, C_0 and C_1, in the complex plane surrounding a point z_0.

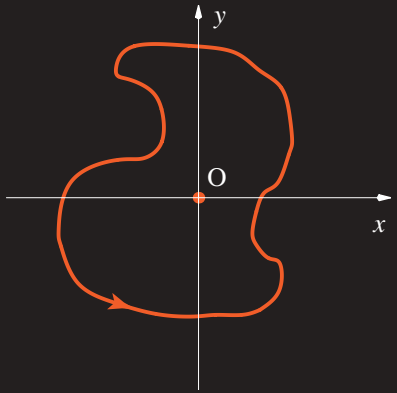

Figure 18.16
An arbitrary simple closed curve surrounding the origin.

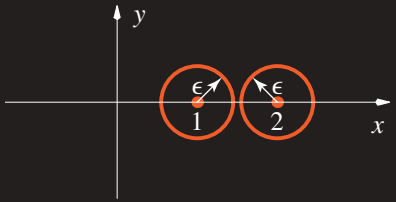

Figure 18.17
The deformation of the circle described by $|z| = 3$ into two circles of radii ϵ enclosing the points $z = 1$ and $z = 2$.

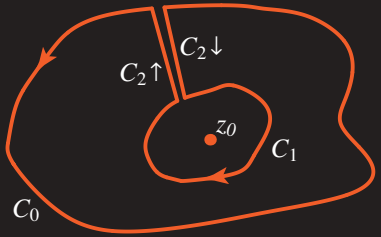

Figure 18.18
A cut from C_0 to C_1 and back for the two simple closed curves shown in Figure 18.15, along with an indication of the positive transits of z along C_0 and C_1 and back and forth along C_2. The two transits along C_2 are separated in the figure only for illustrative purposes.

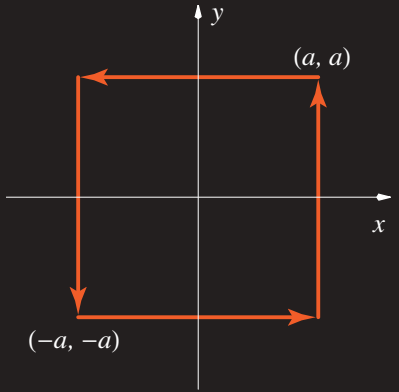

Figure 18.19
The counterclockwise integration path around the square whose vertices are $(\pm a, \pm a)$.

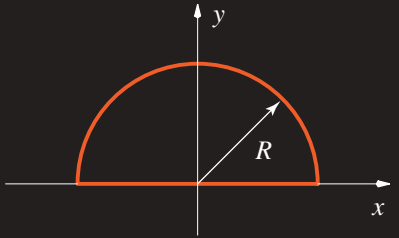

Figure 18.20
A semicircular contour of radius R in the upper half plane.

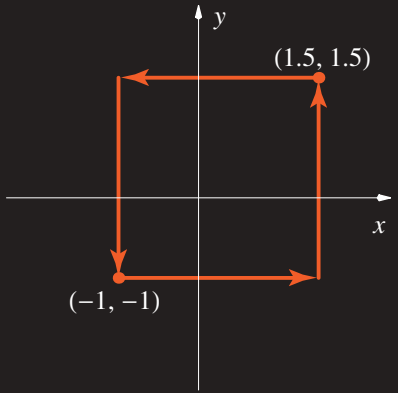

Figure 18.21
The closed curve used in Problem 17.

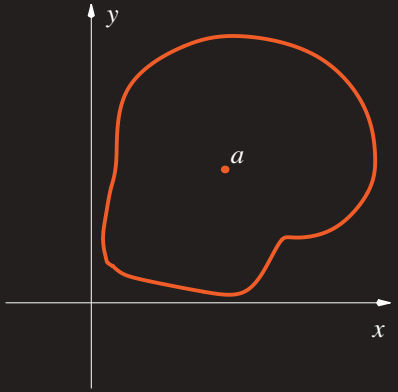

Figure 18.22
A contour C in Equation 1 along with the point a.

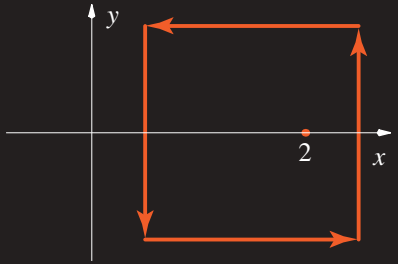

Figure 18.23
A rectangle surrounding the point $z = 2$.

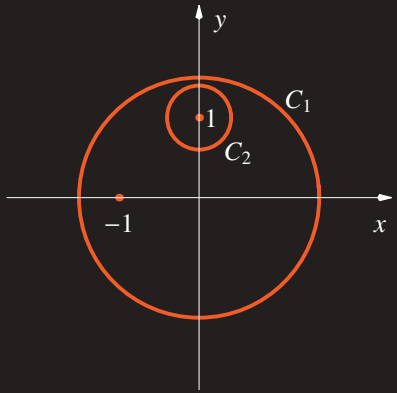

Figure 18.24
The two contours to be used to evaluate the integral in Example 2.

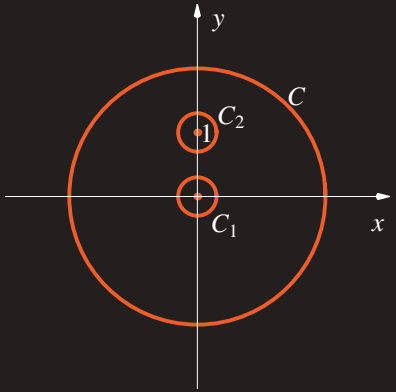

Figure 18.25
The deformation of the contour described by $|z| = 2$ into the contours C_1 and C_2 in order to evaluate the integral given in Example 4.

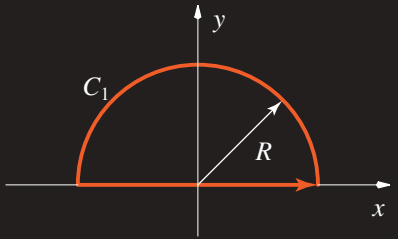

Figure 18.26
The contour for Problem 15.

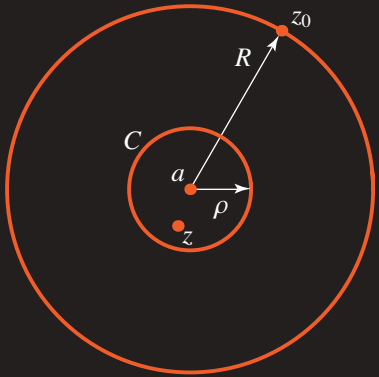

Figure 18.27
The geometry used to derive Equation 9 from Equation 5.

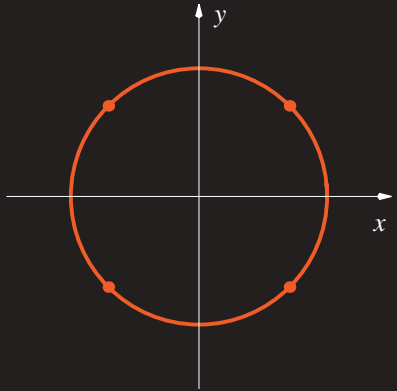

Figure 18.28
The four roots of $z^4 + 1 = 0$.

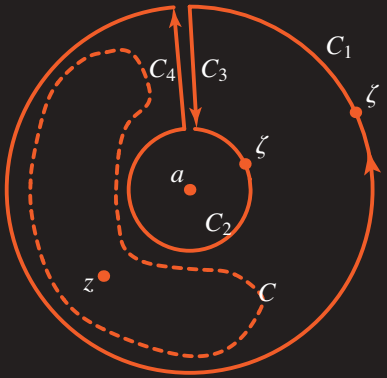

Figure 18.29
The geometry used to derive Equations 12 through 14. The point z lies in the region between C_1 and C_2.

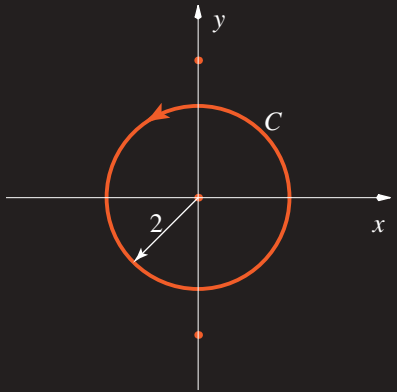

Figure 18.30
The contour used in Example1 and the singular points of the integrand.

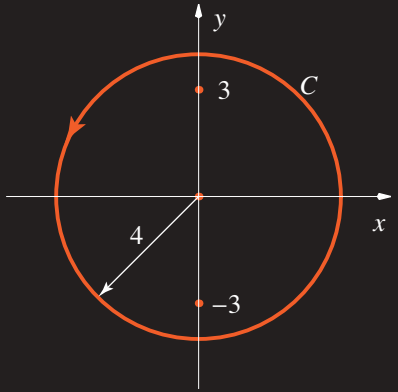

Figure 18.31
The contour described by $|z| = 4$ and the singular points of the integrand of the integral in Example 1.

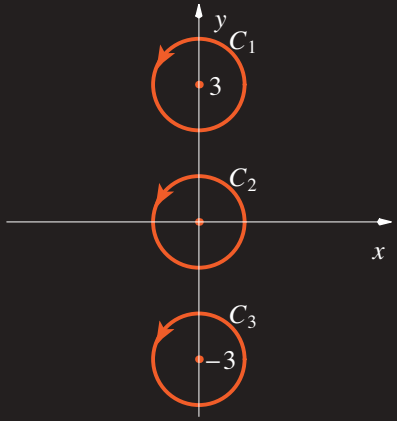

Figure 18.32
The deformation of the contour in Figure 18.31.

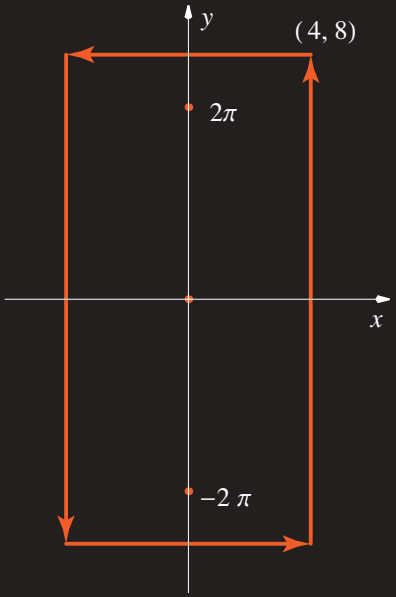

Figure 18.33
The contour used in Problem 21.

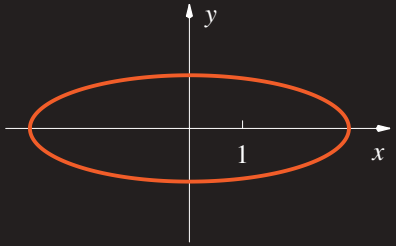

Figure 18.34
The contour used in Problem 23.

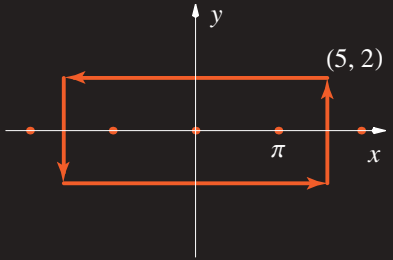

Figure 18.35
The contour used in Problem 24.