Chapter 8 Figures 26 To The End 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 18)". Continuing to hold down the mouse button and dragging the button down will change the text in the small window to something like "8.29 (6 of 18)". Releasing the mouse button at this point moves you to Figure 8.29 of Chapter 8. The (6 of 18) indicates that Figure 8.4 resides on page 6 of the 18 pages of this document.

ANIMATIONS

There are no animations in this chapter.

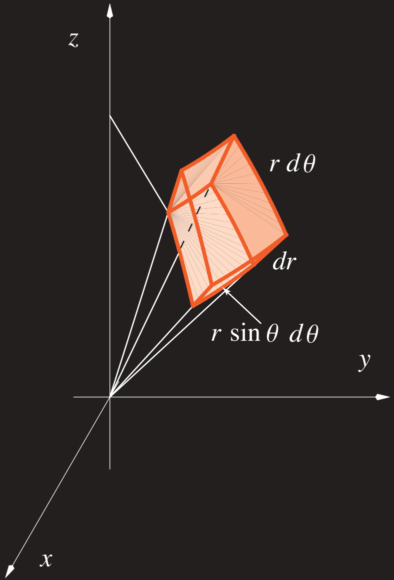

Figure 8.26
A pictorial argument that the volume element in spherical coordinates is given by $dV = r^2 \sin\theta\, dr\, d\theta\, d\phi$.

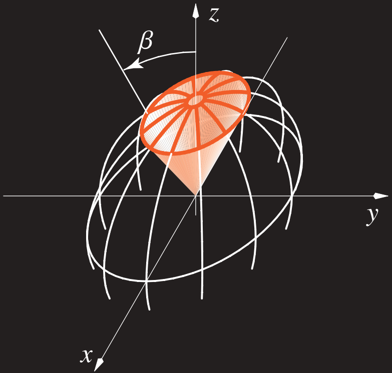

Figure 8.27
The volume to be determined in Example 3.

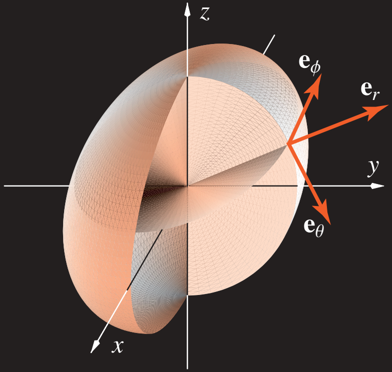

Figure 8.28
The unit vectors $\mathbf{e}_r$, $\mathbf{e}_\theta$, and $\mathbf{e}_\phi$ of a spherical coordinate system.

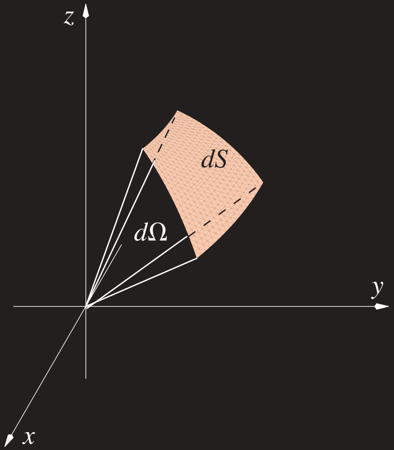

Figure 8.29
An illustration of a solid angle $d\Omega$.

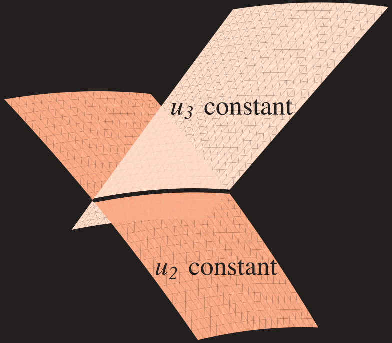

Figure 8.30
The intersection of two coordinate surfaces produces a coordinate curve.

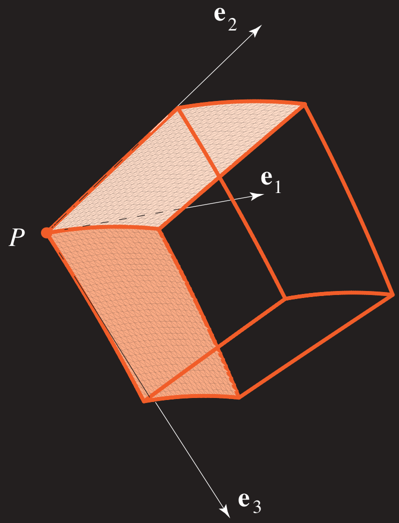

Figure 8.31
The coordinate surfaces of an orthogonal coordinate system are mutually perpendicular at any point of intersecion.

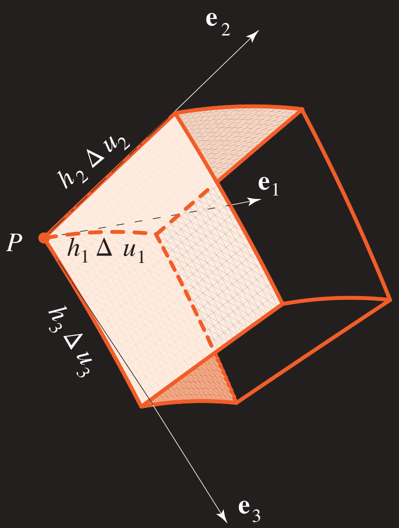

Figure 8.32
The volume formed by a set of intersecting orthogonal coordinates surfaces and used to help derive an expression for div **v** in curvilinear coordinates in Problem 11.

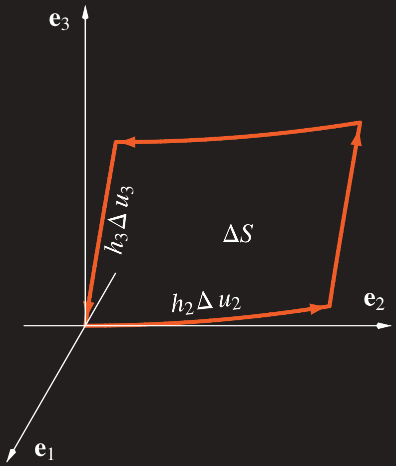

Figure 8.33
The u_1 = constant curvilinear surface that is used to derive an expression for **curl v** in curvilinear coordinates in Problem 13.

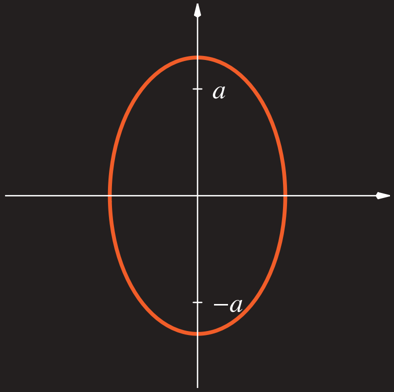

Figure 8.34
A prolate spheroid is obtained by rotating the ellipse in the figure about its long axis.

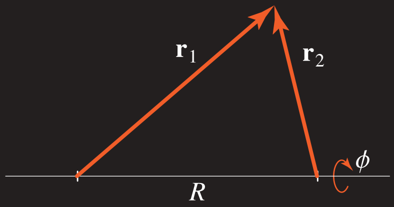

Figure 8.35
The geometry associated with a hydrogen molecular ion, H_2^+. The two nuclei are separated by a distance $R = 2\,a$ and the electron is located at the point (x, y, z).

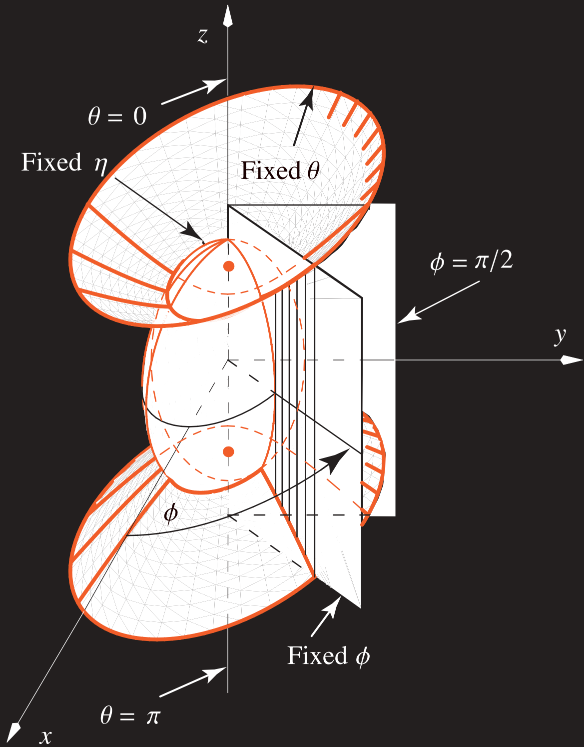

Figure 8.36
A prolate spheroidal coordinate system. The coordinate surfaces are prolate spheroids given by η = constant, hyperboloids of two sheets given by θ = constant, and planes containing the z axis given by ϕ = constant.

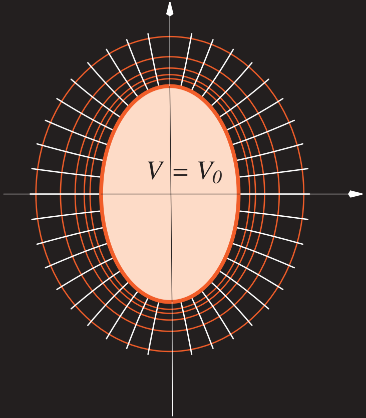

Figure 8.37
The equipotential surfaces (color) and the corresponding electric field (white) about a prolate spheroid held at a fixed potential.

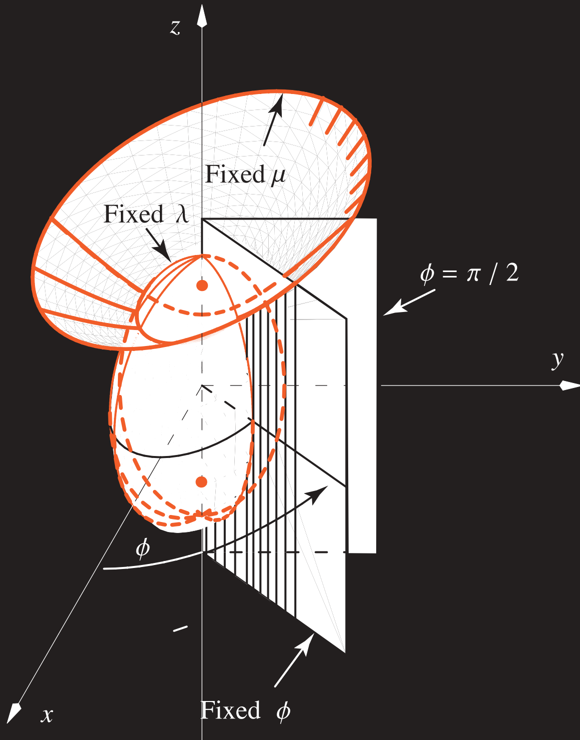

Figure 8.38
A bipolar coordinate system, where $\lambda = \frac{(r_1 + r_2)}{2a}$, $\mu = \frac{(r_1 - r_2)}{2a}$, and ϕ is the angle about the interfocal axis.

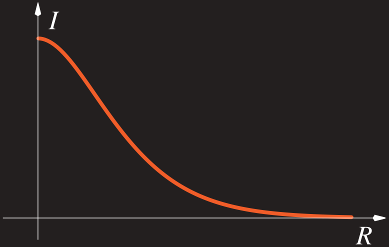

Figure 8.39
The overlap integral, Equation 12, which is a measure of the overlap of the wave function centered on one nucleus with the wave function centered on the other nucleus.

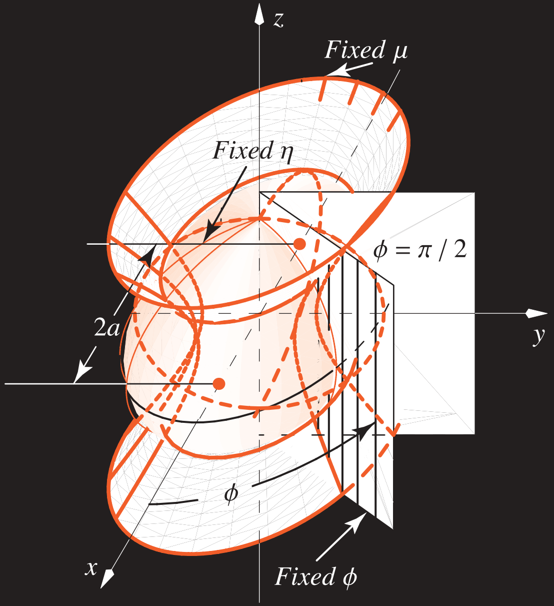

Figure 8.40
An oblate spheroidal coordinate system.

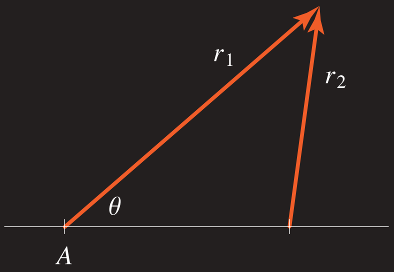

Figure 8.41
The geometry used in Problem 10 to evaluate the overlap integral in Equation 11.