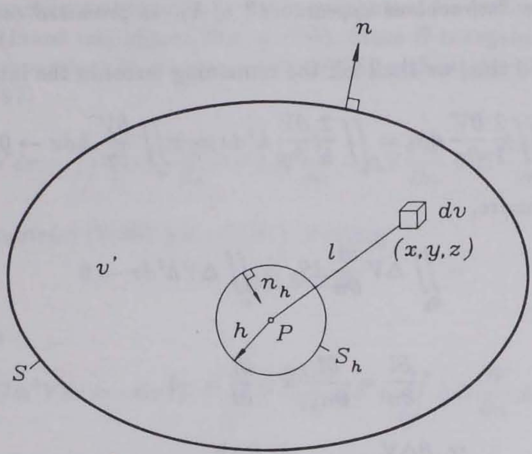

FIGURE 7.9: Illustrating the method of Green's function

where we have already taken into account (7–81), (7–84), and (7–85) and where we have used the abbreviation

$$\iint_{S,S_h} dS = \iint_S dS + \iint_{S_h} dS_h \quad . \tag{7–87}$$

Now

$$\iint_{S_h} \left(-2V \frac{\partial}{\partial n_h}\left(\frac{1}{l}\right)\right) dS_h \doteq -2V_P \iint_{S_h} \frac{\partial}{\partial n_h}\left(\frac{1}{l}\right) dS_h \tag{7–88}$$

since, because of the continuity of V, $V \doteq V_P$ inside and on S_h, the approximation is becoming better and better as $h \to 0$. Fig. 7.9 shows that

$$\frac{\partial}{\partial n_h} = -\frac{\partial}{\partial l} \;, \tag{7–89}$$

so that

$$\frac{\partial}{\partial n_h}\left(\frac{1}{l}\right) = -\frac{d}{dl}\left(\frac{1}{l}\right) = \frac{1}{l^2} = \frac{1}{h^2}$$

since $l = h$ on S_h. Furthermore

$$dS_h = h^2 d\sigma \quad , \tag{7–90}$$

with $d\sigma$ denoting the element of the unit sphere as usual. Thus the integral (7–88) becomes

$$-2V_P \iint_\sigma \frac{1}{h^2} h^2 d\sigma = -2V_P \iint_\sigma d\sigma = -8\pi V_P \quad , \tag{7–91}$$