(for the sake of generality, we keep the notation $\partial r/\partial\theta$ because later on r will depend on t as well).

In view of (4–154) we may write (4–152) and (4–153) as

$$\begin{aligned} -dx &= r\sin\theta\left(1-\frac{r_\theta}{r}\cot\theta\right)d\theta \quad , \\ ds &= \sqrt{r^2+r_\theta^2}\,d\theta \quad , \end{aligned} \tag{4–156}$$

and substitute into (4–151) and then into (4–150). The result is

$$\frac{1}{R_2}=\frac{1}{\sqrt{r^2+r_\theta^2}}\left(1-\frac{r_\theta}{r}\cot\theta\right) \quad . \tag{4–157}$$

Combining (4–148) and (4–157) we thus have for the mean curvature (1–20)

$$J=\frac{1}{2}\left(\frac{1}{R_1}+\frac{1}{R_2}\right)=\frac{1}{2\sqrt{r^2+r_\theta^2}}\left(2-\frac{r_\theta}{r}\cot\theta+\frac{r_\theta^2-rr_{\theta\theta}}{r^2+r_\theta^2}\right) \quad . \tag{4–158}$$

Consider now Wavre's function (4–145),

$$N=\frac{dn}{dt} \quad ,$$

using Fig. 4.8. Along the straight line OP' we obviously have $\theta=$ const., so that

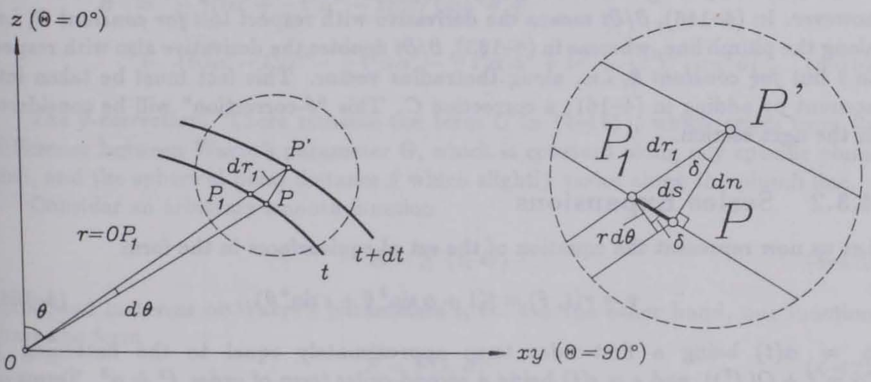

FIGURE 4.8: The distance between two neighboring equisurfaces

$$dr_1=r_t dt=\frac{\partial r}{\partial t}\,dt \quad ,$$

which is the change of r because of t only. From the enlarged part of Fig. 4.8 we read

$$dn=dr_1\cos\delta=r_t dt\cos\delta \quad ,$$