Solution. For a horizontal tangent line we have $\Psi = \Pi - \Theta$, (or $\Psi = \Theta$).Then

$$\frac{r}{r'} = \tan\Psi = -\tan\Theta$$

$$\Rightarrow -\tan\Theta = \frac{r}{r'} = \frac{r^2}{rr'} = \frac{9\cos 2\Theta}{-9\sin 2\Theta} = -\cot 2\Theta$$

$$\Rightarrow \tan\Theta\tan 2\Theta = 1 \Rightarrow \tan\Theta = \pm 1/\sqrt{3} \Rightarrow \Theta = \pm\Pi/6 + \Pi$$

$$\Rightarrow \Theta_{1,2} = \pm\Pi/6, \quad \Theta_{3,4} = \pm\Pi/6 + \Pi$$

and

$$\Psi_{1,2} = \Pi - \Theta_{1,2} = \Pi \pm \frac{\Pi}{6}, \qquad \Psi_{3,4} = \pm\frac{\Pi}{6}.$$

EXAMPLE 0.1. Show that the circles $r = 2\sin\Theta$ and $r = 4\cos\Theta$ intersect orthogonally.

Solution.
$2\sin\Theta = 4\cos\Theta \Rightarrow \quad \tan\Theta = 2 \Rightarrow \quad \Theta_0 = \arctan 2.$

$$\tan\Psi_1 = \frac{2\sin\Theta}{2\cos\Theta} = \tan\Theta = 2, \quad \tan\Psi_2 = \frac{4\cos\Theta}{-4\sin\Theta} = -\cot\Theta = -1/2$$

Then

$$\mu_1.\mu_2 = -1$$

C. SURFACE AREA OF A SURFACE OV REVOLUTION.

A surface of revolution is a surface generated when a curve is revolved about a (straight) line. This line is called the symmetry axis of the surface.

Sphere is a familiar example of a surface of revolution.

Let $y = f(x)$ be a function with continuous derivative on (a, b).When the curve is rooted about the x-axis (or y-axis) it generates a surface of revolution of area S_{ox} (or S_{oy}).

Consider an element of *arc ds*. After revolution it generates an element of surface in the shape of a slice of a