

$$L11 \geq 2 \quad \Phi(r, \theta) = (r \cos \theta, r \sin \theta, \theta)$$

$$r \in [0, 1]$$

$$\theta \in [0, 4\pi]$$

$$\bar{T}_r = [\cos \theta, \sin \theta, 0]$$

$$\bar{T}_r \times \bar{T}_\theta = [\sin \theta, -\cos \theta, \underbrace{r \cos^2 \theta + r \sin^2 \theta}_r] =$$

$$\bar{T}_\theta = [-r \sin \theta, r \cos \theta, 1]$$

$$\|\bar{T}_r \times \bar{T}_\theta\| = \sqrt{1+r^2}$$

$$A(S) = \int_0^{4\pi} \int_0^1 \|\bar{T}_r \times \bar{T}_\theta\| dr d\theta = \int_0^{4\pi} \int_0^1 \sqrt{1+r^2} dr d\theta = \dots$$

$$= 2\pi (\sqrt{2} + \ln(1+\sqrt{2}))$$