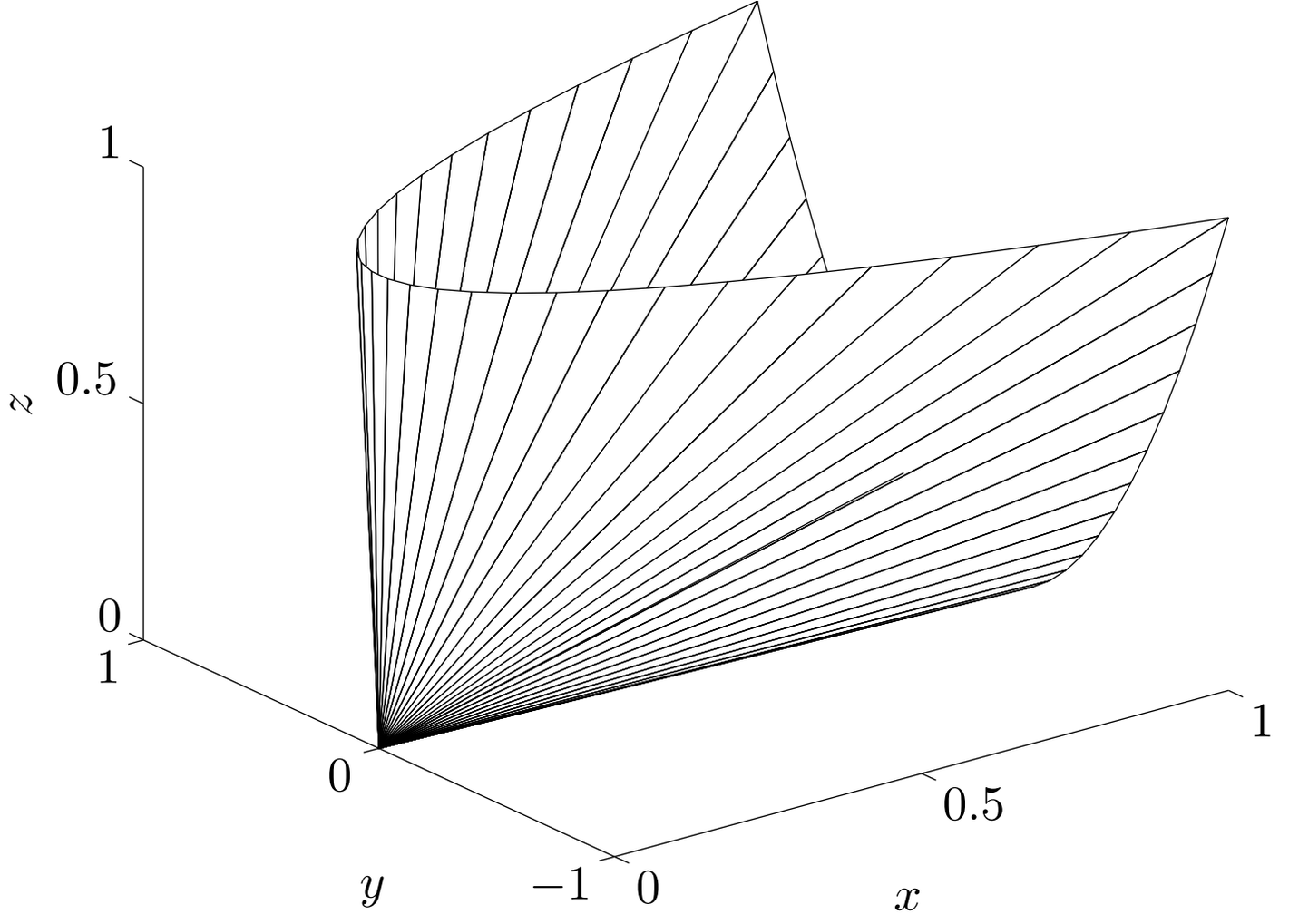

Figure 2.12 Boundary of positive semidefinite cone in $\mathbf{S}^2$.

The set $\mathbf{S}_+^n$ is a convex cone: if $\theta_1, \theta_2 \geq 0$ and $A,\ B \in \mathbf{S}_+^n$, then $\theta_1 A + \theta_2 B \in \mathbf{S}_+^n$. This can be seen directly from the definition of positive semidefiniteness: for any $x \in \mathbf{R}^n$, we have

$$x^T(\theta_1 A + \theta_2 B)x = \theta_1 x^T A x + \theta_2 x^T B x \geq 0,$$

if $A \succeq 0$, $B \succeq 0$ and θ_1, $\theta_2 \geq 0$.