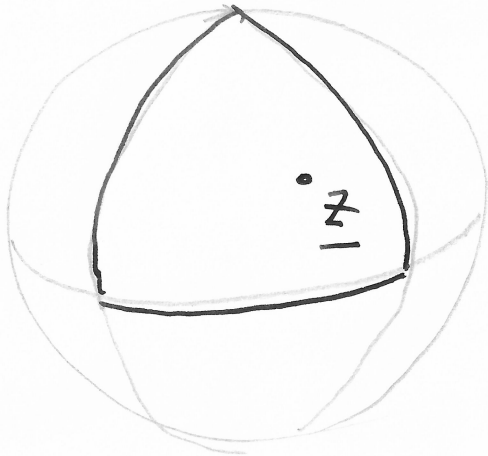
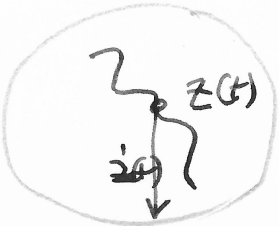
- S_+ is the positive orthant of the d-dimensional sphere ($d = 3$)



- $S_+ = \{ \underline{z} \in \mathbb{R}^d \mid \sum_j z_j^2 = 1, \; z_j > 0 \}$
- $t \mapsto \underline{z}(t)$ is a curve with <u>velocity</u> $\dot{\underline{z}}(t) = \left(\frac{d}{dt} z_j(t) \mid j = 1 \dots d \right)$
- the <u>tangent space at $\underline{z}$</u> is the space of all possible velocities $T_{\underline{z}} S_+$. A vector $\underline{v} \in T_{\underline{z}} S_+$ iff $\underline{v} \cdot \underline{z} = 0$
- The <u>tangent bundle</u> TS_+ is the ~~set~~ of all <u>bound</u> tangent vectors

$$TS_+ = \{ (\underline{z}, \underline{v}) \mid \underline{z} \in S_+, \; \underline{z} \cdot \underline{v} = 0 \}$$



$\frac{1}{2}$ <u>PROOF</u>: $\frac{d}{dt} |\underline{z}(t)|^2 = \frac{1}{2} \sum_j z_j(t) \dot{z}_j(t) = 0$