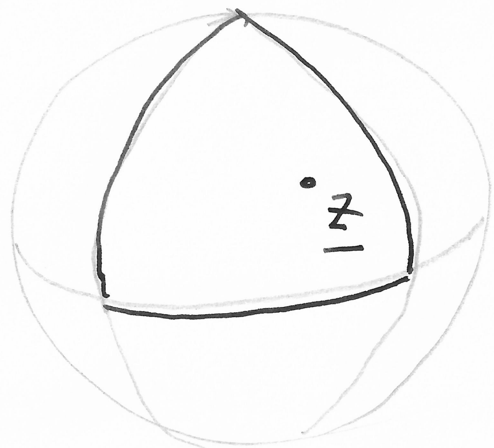
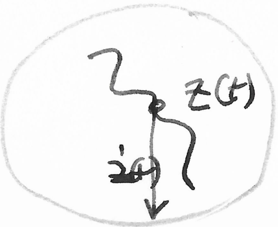
- S_+ is the positive orthant of the d-dimensional sphere ($d=3$)



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

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



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