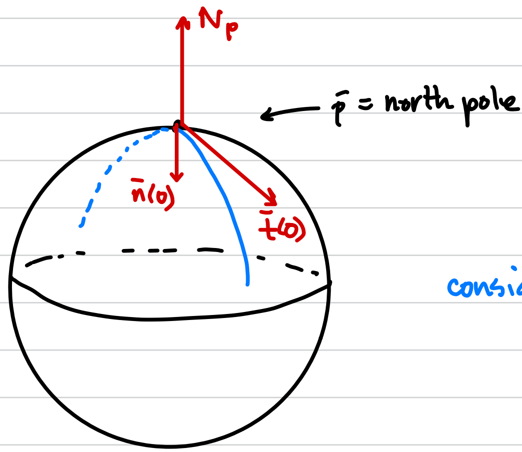
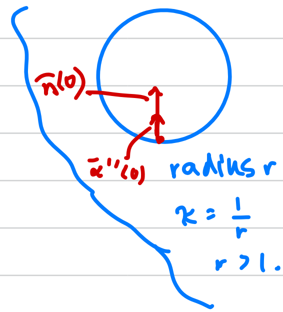
<u>Ex</u> sphere, radius 5, oriented outwards.

Sps. $\bar{\alpha}$ great circle, p.b.a.l.





consider: $\bar{t}'(0)$ a.k.a. $\bar{\alpha}''(0)$

a.k.a. $\kappa\bar{n}(0)$.

a.k.a. $\frac{d\bar{\alpha}'(s)}{ds}$.

Then $\bar{n}(0) = (0,0,-1)$ and $\kappa\bar{n}(0) = (0,0,-\frac{1}{5})$

$\kappa = \frac{1}{5}$

a.k.a. $\bar{\alpha}''(0)$

$\frac{d}{ds}\bar{\alpha}'(0)$.

$\bar{\alpha}''(s)$

Here: $\kappa\bar{n}(0) \parallel N_p$

so $\kappa_n = -\frac{1}{5}$

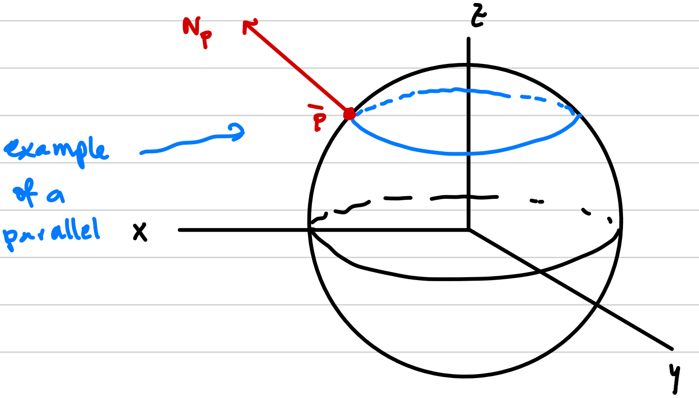
says $\frac{D\bar{\alpha}'(0)}{ds} = 0$

Since $\kappa^2 = \kappa_g^2 + \kappa_n^2$, $\kappa_g = 0$. so $\bar{\alpha}$ geod. at $\bar{p}$,

and by similar arguments $\bar{\alpha}$ a geodesic.

__Non Ex__. Sphere, radius 5, oriented outwards.

C = horizontal cross-section, height 4.



$\bar{\alpha}(t) = (3\cos t,\ 3\sin t,\ 4)$

↳ note: $\bar{\alpha}$ <u>not</u> p.b.a.l.

$\bar{\alpha}(0) = (3,0,4) \quad = \bar{p}$

$N_p = \left(\frac{3}{5},\ 0,\ \frac{4}{5}\right)$

↳ (normalized position vector)

$\bar{\alpha}(t)$ is <u>not</u> a geodesic.

↳ exercise: compute $\frac{D\bar{\alpha}'(t)}{dt}$, reparam. $\bar{\alpha}$ b.a.l.

compute κ, κ_n, κ_g,

Confirm $\kappa^2 = \kappa_n^2 + \kappa_g^2$.