In $\mathbb{R}^3$, need a third vector and a way to measure how $\bar{\alpha}$ "lifts off" the osculating plane.

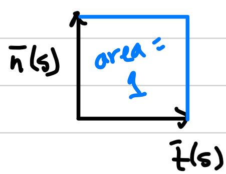
Assume $\kappa(s) \neq 0$, so $\bar{n}(s)$ is well-defined. Let

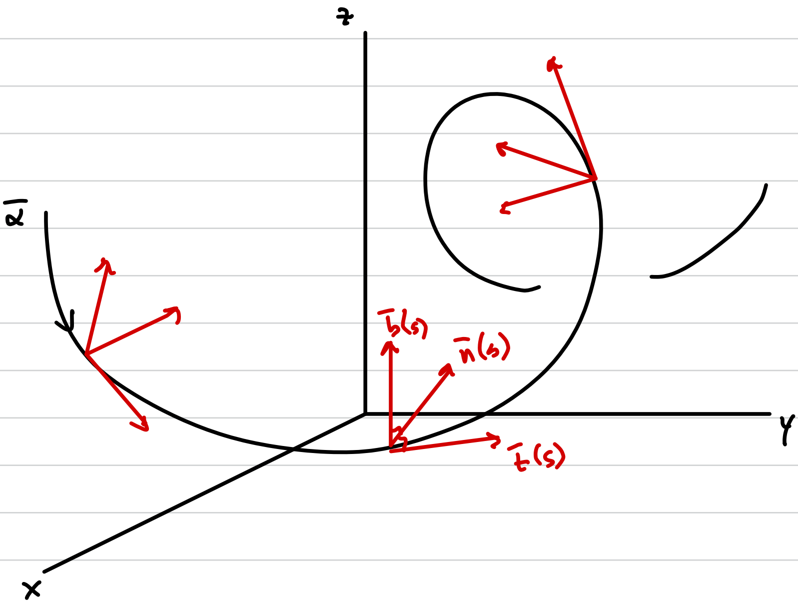
$$\bar{b}(s) = \bar{t}(s) \times \bar{n}(s).$$

the <u>binormal vector</u> to $\bar{\alpha}$ at s.

Notes:

- $\bar{b}(s) \perp \bar{t}(s)$ and $\bar{b}(s) \perp \bar{n}(s)$.
- $|\bar{b}(s)| = 1$





$\{\bar{t}(s), \bar{n}(s), \bar{b}(s)\}$ is a Serret - Frenet frame to $\bar{\alpha}$ at s.

orthonormal basis situated at $\bar{\alpha}(s)$.

a.k.a. adapted orthonormal moving frame

Note: Change of $\bar{b}(s)$ should measure "lifting" of $\bar{\alpha}$ from osculating plane determined by $\bar{t}(s)$ and $\bar{n}(s)$.

helix