$\underline{r}(t)$ → $\underline{v}(t) = \frac{d\underline{r}}{dt}$ → $\frac{ds}{dt} = |\underline{v}|$

$\underline{v} = \frac{d\underline{r}}{dt}$ → $\hat{T} = \frac{d\underline{r}}{ds} = \frac{d\underline{r}}{dt}\frac{dt}{ds} = \frac{\underline{v}}{|\underline{v}|}$ → $\underline{v} = |\underline{v}|\hat{T}$

$\underline{a} = \frac{d\underline{v}}{dt} = \frac{d^2\underline{r}}{dt^2}$

$|\underline{a}|$

$\underline{a} = a_N \hat{N} + a_T \hat{T}$

$= k\left(\frac{ds}{dt}\right)^2 \hat{N} + \frac{d^2s}{dt^2}\hat{T}$

$k = \frac{a_N}{|\underline{v}|^2} = \frac{\sqrt{|\underline{a}|^2 - a_T^2}}{|\underline{v}|^2}$

$\frac{ds}{dt} = |\underline{v}|$

$k = \left|\frac{d\hat{T}}{ds}\right| = \left|\frac{d\hat{T}}{dt}\right|\frac{1}{|\underline{v}|}$

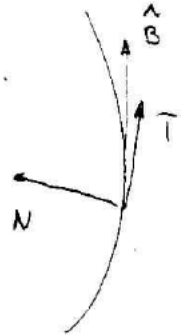
$\hat{N} = \frac{d\hat{T}/ds}{|d\hat{T}/ds|} = \frac{d\hat{T}/ds}{k} = \frac{d\hat{T}/dt}{|d\hat{T}/dt|}$

$\frac{d\hat{T}}{ds} = k\hat{N}$

$\hat{B} = \hat{T} \times \hat{N}$

$\frac{d\hat{B}}{ds} = (-\tau)\hat{N}$

$\tau = -\frac{d\hat{B}}{ds} \cdot \hat{N} = -\frac{1}{|\underline{v}|}\frac{d\hat{B}}{dt} \cdot \hat{N}$



We keep trying to see how $\hat{T}$ and $\hat{B}$ change wrt s and write the result in terms of $\hat{T}, \hat{B}, \hat{N}$