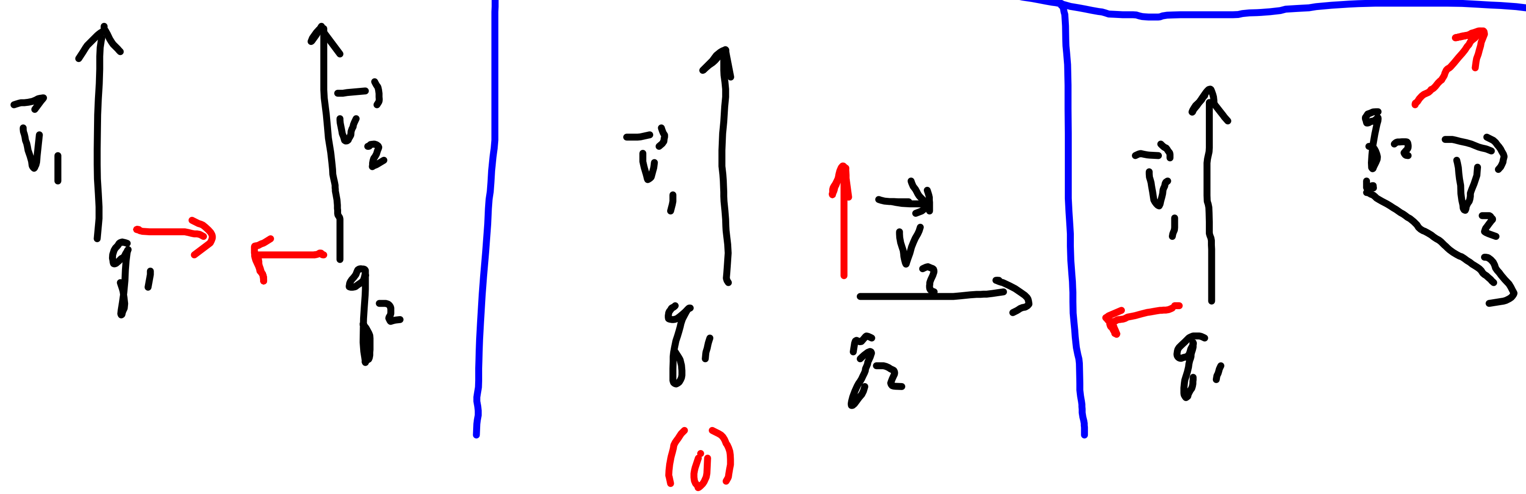
Ampere (magnetic) force.

$$\vec{F}_{\text{on 1 due to 2}} = k\, q_1 q_2\, \vec{V}_1 \times \left\{ \vec{V}_2 \times \frac{\vec{R}_1 - \vec{R}_2}{|\vec{R}_1 - \vec{R}_2|^3} \right\}$$

$$\vec{F}_{\text{on 2 due to 1}} = k\, q_2 q_1\, \vec{V}_2 \times \left\{ \vec{V}_1 \times \frac{\vec{R}_2 - \vec{R}_1}{|\ \ |^3} \right\}$$

SKETCH THE FORCE ON 1 and ON 2.

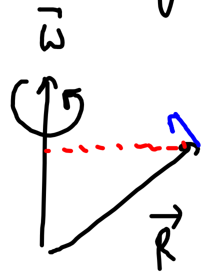


p. 52 #24

$$\vec{\omega} = \frac{(\vec{i}+\vec{j}+\vec{k})}{\sqrt{1+1+1}}(10\sqrt{3})$$

$$= 10(\vec{i}+\vec{j}+\vec{k})$$

(p.46)



$\vec{v} = \vec{\omega} \times \vec{R}$

$|\vec{v}| = \omega \cdot$ radius

If $|\vec{v}| = 20$ ft/sec, $20 = (10\sqrt{3})(\text{radius})$

locus = points on a cylinder around $\vec{\omega}$, with radius $\frac{20}{10\sqrt{3}}$

Chpt 2: Differentiation.

$$\vec{F}(t) = t^2\vec{i} + t^3\vec{j}$$

$$\frac{d\vec{F}}{dt} = 2t\vec{i} + 3t^2\vec{j}$$

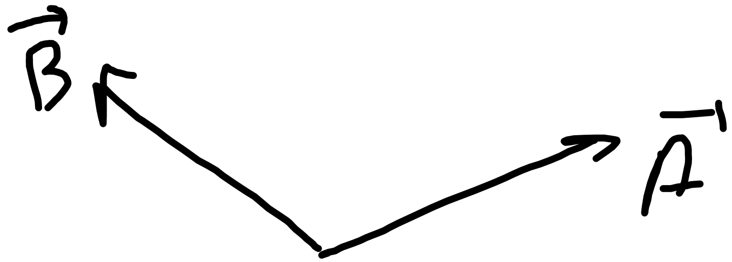
$$\frac{d}{dt}\left[\vec{F}(t)\cdot\vec{G}(t)\right] = \frac{d\vec{F}}{dt}\cdot\vec{G} + \frac{d\vec{G}}{dt}\cdot\vec{F}$$

$$\frac{d}{dt}\left[\left(3t\vec{i} + 5t^2\vec{j}\right)\cdot\left(t\vec{i} - \sin t\,\vec{j}\right)\right]$$

$$\frac{d}{dt}\left[3t^2 - 5t^2\sin t\right] = 6t - 10t\sin t - 5t^2\cos t$$

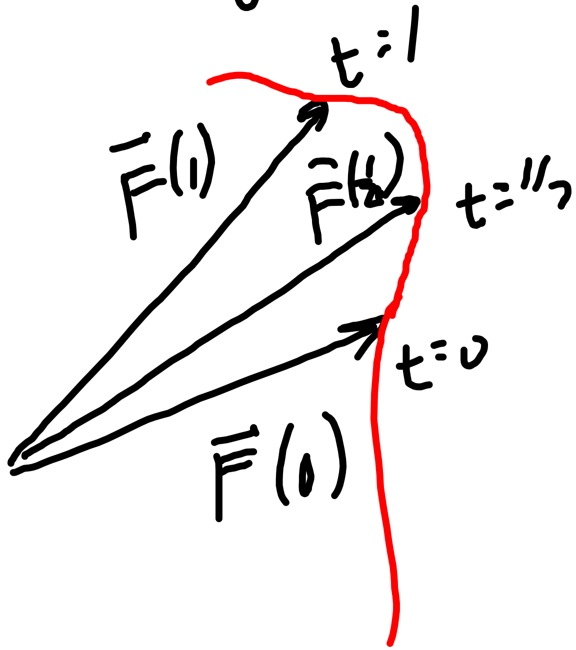
$$\frac{d}{dt}\left[\vec{F}(t)\times\vec{G}(t)\right] = \vec{F}\times\frac{d\vec{G}}{dt} + \vec{G}\times\frac{d\vec{F}}{dt} \quad \text{No}$$

$$= \vec{F}\times\frac{d\vec{G}}{dt} + \frac{d\vec{F}}{dt}\times\vec{G}$$



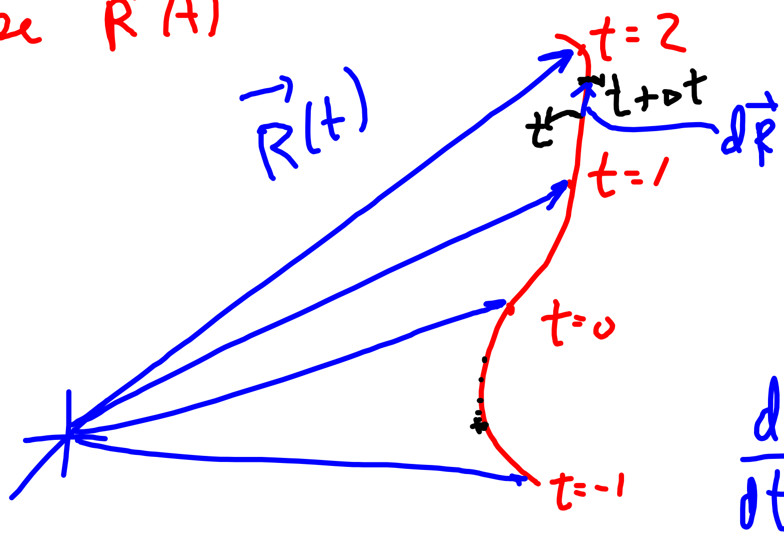
$\vec{A}\times\vec{B}$ comes out of board $\odot$

Interpretation of $\vec{F}(t)$.



Think of $\vec{F}(t)$ as tracing out a curve.

Use "$\vec{R}(t)$"



What is $\frac{d\vec{R}}{dt}$?

$$\frac{d\vec{R}}{dt} = \lim_{\Delta t \to 0} \frac{\vec{R}(t+\Delta t) - \vec{R}(t)}{\Delta t}$$

$\frac{d\vec{R}}{dt}$ is velocity

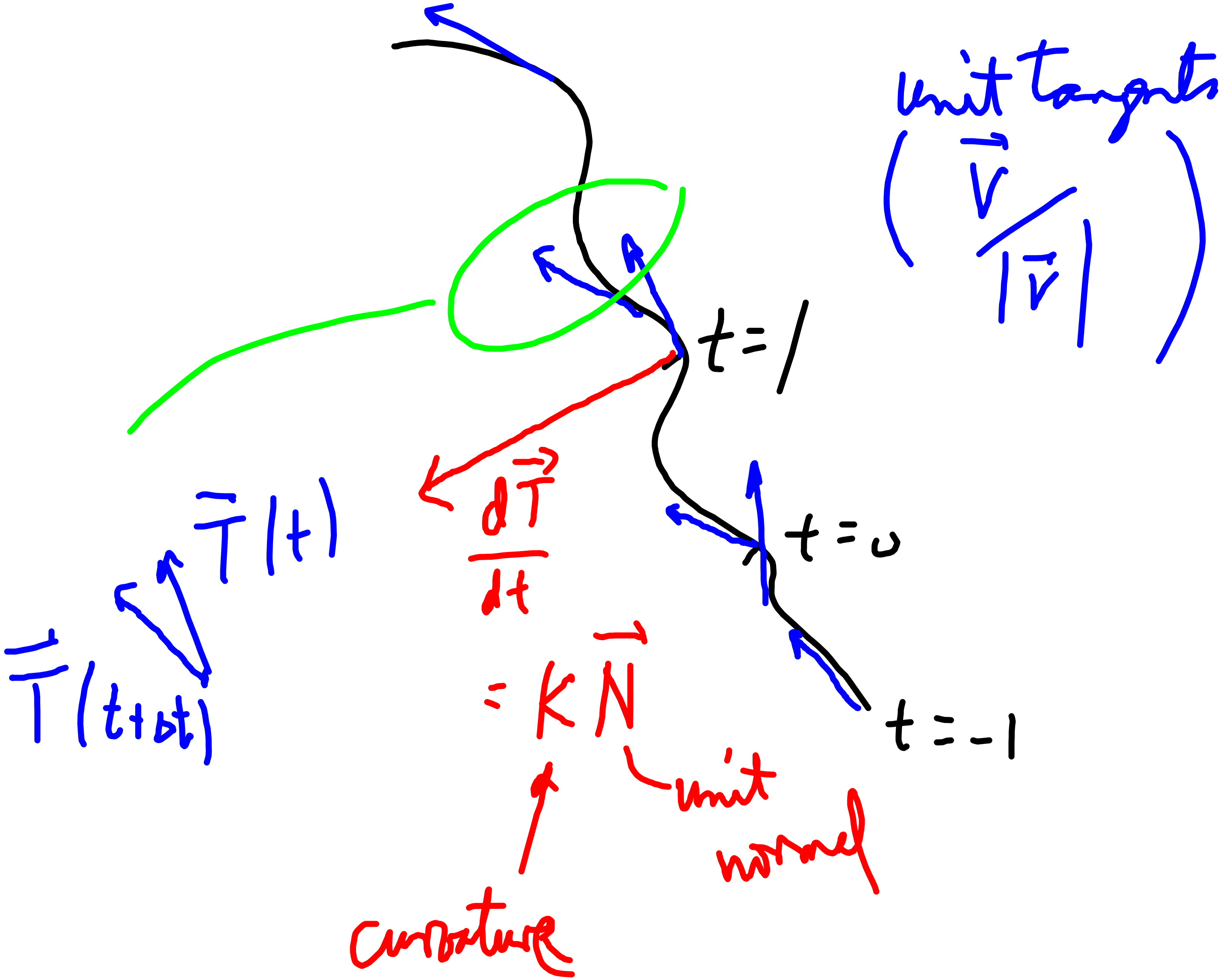
$\left|\frac{d\vec{R}}{dt}\right|$ is speed

direction $\frac{d\vec{R}}{dt}$ is tangent to curve.

$\vec{R}(t)$ describes a trajectory

$\frac{d\vec{R}}{dt}(t)$ " velocity

$\frac{d^2\vec{R}}{dt^2}(t)$ " acceleration.



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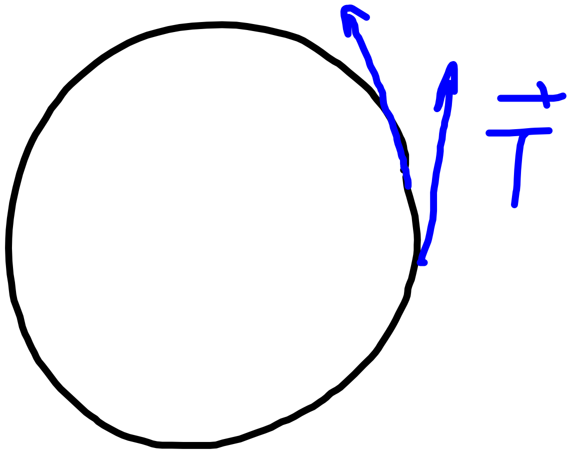
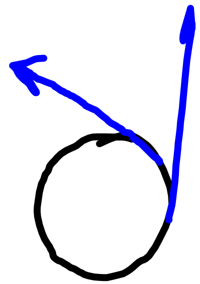
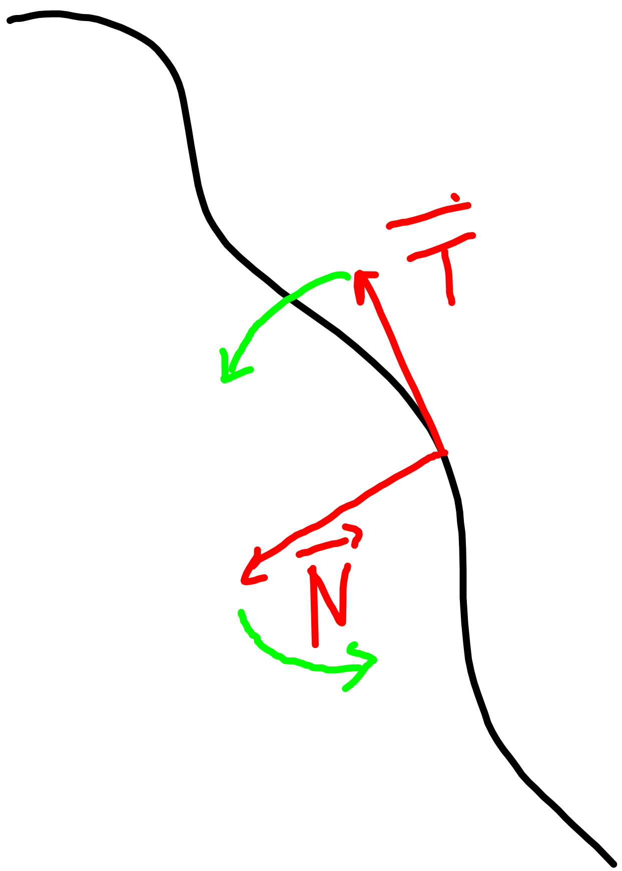




~~curvat~~

$\text{curvature} = \frac{1}{\text{radius}}$



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

binormal

$$\frac{d\vec{T}}{dt} = \kappa \vec{N}$$

$$\frac{d\vec{N}}{dt} = -\kappa \vec{T} + \tau \vec{B}$$

torsion

effect of 3-D curve

$$\frac{d\vec{B}}{dt} = -\tau \vec{N}$$