

$$K = \frac{|\mathbf{r}' \times \mathbf{r}''|}{|\mathbf{r}'|^3} = \frac{|\mathbf{T}'|}{|\mathbf{r}'|} = \left| \frac{d\mathbf{T}}{ds} \right|$$

$$\mathbf{T} = \frac{\mathbf{r}'}{|\mathbf{r}'|} \quad \mathbf{r}' = |\mathbf{r}'| \mathbf{T} = \frac{ds}{dt} \mathbf{T}$$

$$\mathbf{r}'' = \frac{d^2s}{dt^2} \mathbf{T} + \frac{ds}{dt} \mathbf{T}'$$

$$\mathbf{r}' \times \mathbf{r}'' = \left(\frac{ds}{dt} \right) \left(\frac{d^2s}{dt^2} \right) (\mathbf{T} \times \mathbf{T}) + \left(\frac{ds}{dt} \right)^2 (\mathbf{T} \times \mathbf{T}') \quad \rightarrow 0$$

$$|\mathbf{r}' \times \mathbf{r}''| = \left(\frac{ds}{dt} \right)^2 |\mathbf{T}| |\mathbf{T}'| \sin \theta \quad \rightarrow 90^\circ$$

$$\frac{|\mathbf{r}' \times \mathbf{r}''|}{|\mathbf{r}'|^2} = |\mathbf{T}'|$$

$$K = \frac{|\mathbf{T}'|}{|\mathbf{r}'|} = \frac{|\mathbf{r}' \times \mathbf{r}''|}{|\mathbf{r}'|^3}$$

$$r(t) = \langle t, t^2, t^3 \rangle$$

$$K = ?$$

$$\text{at } \underline{\underline{t=0}}$$

$$r' = \langle 1, 2t, 3t^2 \rangle$$

$$\underline{\underline{t=0}} \quad = \langle 1, 0, 0 \rangle$$

$$r'' = \langle 0, 2, 6t \rangle$$

$$\underline{\underline{t=0}} \quad = \langle 0, 2, 0 \rangle$$

$$r' \times r'' = \langle 0, 0, 2 \rangle$$

$$|r' \times r''| = 2 \quad |r'| = 1$$

$$K = \frac{2}{1^3} = 2$$

$$K = \frac{|r' \times r''|}{|r'|^3}$$

$$y = x^2$$

$$y = f(x)$$

$$r' = \langle 1, f', 0 \rangle$$

$$r(x) = \langle x, f(x), 0 \rangle$$

$$r'' = \langle 0, f'', 0 \rangle$$

$$|r' \times r''| = |\langle 0, 0, f'' \rangle| = |f''|$$

$$K = \frac{|f''|}{\sqrt{1+(f')^2}^3}$$

$$y = x^2$$

$$K = y'' \Rightarrow \textcircled{2}$$

$$y = e^x$$

