$f(x(t))$

y

$||\dot{\vec{r}}(t)||_2 \, \hat{t} = \dot{\vec{r}}(t) \neq \dfrac{d||\vec{r}(t)||_2}{dt} \, \hat{t}$

$\text{where,} \quad \hat{t} = \dfrac{1}{\sqrt{1+f'(x)^2}} \begin{pmatrix} 1 \\ f'(x) \end{pmatrix}$

$\vec{r}(t)$

$\vec{j}$

$\vec{i}$

x