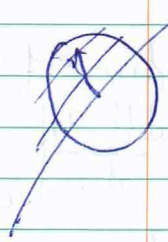
$$f(0,t) = \exp_{c(t)} 0 = c(t)$$



$$\frac{\partial f}{\partial s}(0,t) = \frac{d}{ds} \exp_{c(t)} sV(t) \Big|_{s=0}$$

$$= (d\exp_{c(t)})^{s=0} V(t) = V(t).$$

If $V(0) = V(a) = 0$

then $f(s,0) = \exp_{c(0)} s\overset{0}{V}(0) = c(0)$

$$f(s,a) = \exp_{c(a)} 0 = c(a). \quad \#$$

Def f : variation of c

$$L(s) = \int_0^a \left| \frac{\partial f}{\partial t}(s,t) \right| dt, \quad s \in (-\varepsilon, \varepsilon)$$

$$E(s) = \int_0^a \left| \frac{\partial f}{\partial t}(s,t) \right|^2 dt. \quad s \in (-\varepsilon, \varepsilon).$$

Cauchy-Schwarz $\Rightarrow$

$$L^2 \leq a E$$

"$=$" iff t proportional to arc-length