## 莱布尼兹积分规则推导

表虑: 
$$\int_{a(t)}^{b(t)} f(x,t,u) du$$
, where  $u=u(t)$ 

国导教:  $\frac{df}{dt} = \lim_{\Delta t \to 0} \frac{f(t+\Delta t) - f(t)}{\Delta t}$ 

其中:  $f(t+\Delta t) = f(x,t+\Delta t,u+\Delta u)$ 

(N). 根据定义态  $\int_{a(t+\Delta t)}^{b(t+\Delta t)} \frac{f(x,t+\Delta t,u)}{f(x,t+\Delta t,u)} \int_{a(t)}^{b(t)} f(x,t,u)$ 

At

Wednesday, Novymer production of  $f(x,t,u)$  扩充:
$$= \int_{a(t+\Delta t)}^{b(t+\Delta t)} f(x,t,u) \text{ 扩充:}$$

$$= \int_{a(t+\Delta t)}^{b(t+\Delta t)} f(x,t+\Delta t,u) + \int_{a(t+\Delta t)}^{a(t+\Delta t)} f(x,t+\Delta t,u)$$
 $+\int_{a}^{b} f(x,t+\Delta t,u) dt \int_{a(t+\Delta t)}^{b} f(x,t+\Delta t,u) dt$ 
 $+\lim_{\Delta t \to 0} \int_{b(t)}^{b(t)} f(x,t+\Delta t,u) dt \int_{a(t)}^{b} f(x,t+\Delta t,u) dt$ 

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第二限:= d (b(trot)) (x.trot, u) dt - (a(trot)) f(x,trot, u) dt
第二於 = $\frac{d}{dt}\int_{b(t)}^{b(t)}f(x,t+\omega t,u)dt - \int_{a(t)}^{a(t+\omega t)}f(x,t+\omega t,u)dt$ $\frac{2}{dt}\int_{b(t)}^{b(t)}f(x,t+\omega t,u)dt - \int_{a(t)}^{a(t+\omega t)}f(x,t+\omega t,u)dt$
村田村(有:
$\int_{a(t)}^{b(t)} f(x,t,u) = \int_{a(t)}^{b(t)} \frac{\partial}{\partial t} f(x,t,u) dt + f(x,t,u) \left  \begin{array}{c} b'(t) \\ t=b \end{array} \right $ $-f(x,t,u) \left  \begin{array}{c} -f(x,t,u) \\ t=a'(t) \end{array} \right $
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$-f(x,t,u) _{t=a}$
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