$$l_h(y,t) = \begin{cases} 0 & \text{if } yt > 1+h \\ \dfrac{(1+h-yt)^2}{4h} & \text{if } |1-yt| \le h \\ 1-yt & \text{if } yt < 1-h \end{cases}$$

$\frac{dl}{d(yt)} \Rightarrow$

$$l_h'(y,t) = \begin{cases} 0 & \text{if } yt > 1+h \\ \dfrac{-2(1+h-yt)}{4h} & \text{if } 1-h \le yt \le 1+h \\ -1 & \text{if } yt < 1-h \end{cases}$$

at $yt = 1+h$

$\Rightarrow l_h'(y,t) = 0 = l_h'(y,t)$ s.t. $yt > 1+h$, $yt \to 1+h$.

at $yt = 1-h$

$\Rightarrow l_h'(y,t) = -1 = l_h'(y,t)$ s.t. $yt < 1-h$, $yt \to 1-h$.

$\therefore l_h(y,t)$ is differentiable at any point yt

2.1.1

for $yt > 1+h$:

$l_h(y_1t_1) - l_h(y_2t_2) = 0 \le \rho \| y_1t_1 - y_2t_2 \|$

is 0-Lips and upperbound = lowerbound = 0

for $yt < 1-h$:

$l_h(y_1t_1) - l_h(y_2t_2)$

$= 1 - y_1t_1 - 1 + y_2t_2$

$= y_2t_2 - y_1t_1 \le 1 \| y_1t_1 - y_2t_2 \|$

is 1-Lips and bounded.

for $|1-yt| \le h$

$l_h(y_1t_1) - l_h(y_2t_2)$

$= \dfrac{(y_1t_1)^2 - (y_2t_2)^2}{4h}$

let $y_1t_1 = 0$ and $y_2t_2 = 0 + \varepsilon = \varepsilon$

$\Rightarrow \dfrac{(y_1t_1)^2 - (y_2t_2)^2}{4h} = \dfrac{-\varepsilon^2}{4h} \not\le \rho \| 0 - \varepsilon \|$

$\therefore$ in this region, there's no linear boundness

$\therefore$ here is not Lipschitz.

$\because$ different domain has different Lipschitz

$\therefore$ it's not Lipchitz-continuous.