Q1) $f : [a,b] \to \mathbb{R}$ be a function $x \in [a,b)$

Show f is differentiable $f'(x) = l \iff \exists\, u(t)$

(ST) $\lim_{t \to x} u(t) = 0 = u(x)$ & $f(t) = f(x) + f(t-x)(1-u(t))$

t

$$f(t) = f(x) + (t-x)(l+u(t))$$

$$\left\{ f'(x) = \frac{f(t) - f(x)}{t - x} \right\} \quad f(t) \quad f(x) \quad f'(t)(t-x) +$$

$$f(\beta) = f(\alpha) + \frac{f'(\alpha)(\beta-\alpha)}{1} + \frac{f''(\alpha)(\beta-\alpha)^2}{2!} + \frac{f'''(x)(\beta-\alpha)^3}{3!}$$

$$f(-1) = 0 \quad f(0) = 0 \quad f(1) = 1 \quad f'(0) = 0$$

1, 0

$$1 = 0 + \frac{f''(0)}{2} + \frac{f'''(x)}{6} -$$

$$0 = \frac{f''(0)}{2} - \frac{f'''(x)}{6}$$

$$1 = \frac{f'''(x_1)}{6} + \frac{f'''(x_n)}{6} =$$

$$6 = f'''(x_1) + f'''(x_1)$$

$$6 =$$

use L'Hospital's rule to determine.

$$f((1-t)(x_1) + t x_2) \leq 1-t\, f(x_1) + t f(x_2)$$