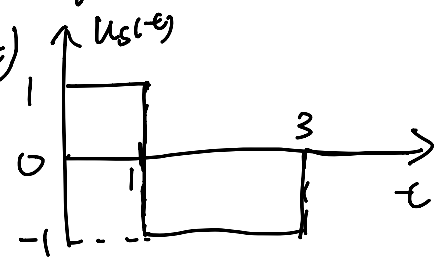
book example 6.3

Q. $u_S(t)$ 

求 (1) $i_L(t)$

(2) $t=2.5$，能量

Formula $\varphi(t) = L\, i(t)$

$$u = \frac{d\varphi}{dt}$$

$$u = L\frac{di}{dt}$$

$$i(t) = \frac{1}{L}\int_{-\infty}^{t} u(\xi)\, d\xi$$

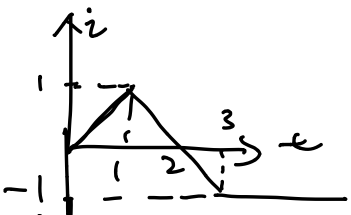
$$i(t) = i(t_0) + \frac{1}{L}\int_{t_0}^{t} u(\xi)\, d\xi$$

$$p(t) = u(t)\, i(t)$$

$$W_L(t) = \int_{-\infty}^{t} p(\xi)\, d\xi = \int_{-\infty}^{t} u(\xi)\, i(\xi)\, d\xi$$

Solution (1) $i(t) = i(0) + \frac{1}{L}\int_{0}^{t} u(\xi)\, d\xi$

$i(0) = 0$，$0 \le t \le 1$ 时.



$i(t) = t$

$1 < t \le 3$ $\quad i(t) = i(1) + \int_{1}^{t} u(\xi)\, d\xi$

$t > 3$ 时，$i(t) = i(3) = 1 - t$

(2) $t=2.5$ 时, $w_L(t) = \int_0^{2.5} u(\varepsilon)\, i(\varepsilon)\, d\varepsilon$.

$$= \int_0^1 1 \times \varepsilon \, d\varepsilon + \int_1^{2.5} (-1)(-\varepsilon+2)\, d\varepsilon$$

$$= \frac{1}{2} + \int_1^{2.5} \varepsilon \, d\varepsilon - 2\,(2.5-1)$$

$$= \frac{1}{2} + \frac{21}{8} - 3 \quad = \frac{1}{8}\ \mathrm{J}$$

$$\left.\frac{\varepsilon^2}{2}\right|_1^{2.5} = \frac{1}{2}\left(\frac{5}{2}^2 - 1\right) = \frac{1}{2}\left(\frac{25}{4} - \frac{4}{4}\right) = \frac{1}{2}\,\frac{21}{4} = \frac{21}{8}$$