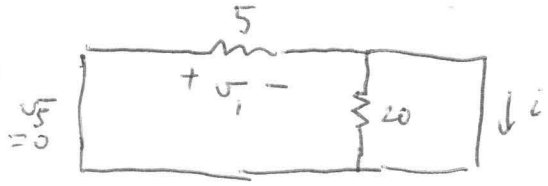
(a) $v_s = 0$ $\quad t = 0^-$:



$v_1(0^-) = 0\,V$

$i(0^-) = 0\,A$

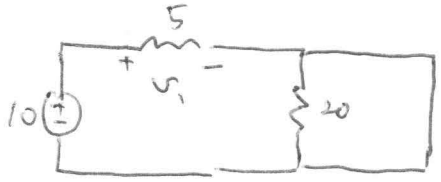
$D = 0\,V$

(b) $v_s = 10$ $\quad t = 0^+$:

$i(0^+) = 0\,A \rightsquigarrow$ open

$v_1(0^+) = 10 \cdot \frac{5}{5+20} = 2\,V$

$t = \infty$:



$i(\infty) = \frac{10}{5} = 2\,A$

$v_1(\infty) = 10\,V$

R_{TH}: $R_{TH} = 5 \| 20 = 4\,\Omega \Rightarrow \tau = \frac{L}{R} = \frac{12}{4} = 3\,s$

$A_1 = -8\,V$

$B_1 = 10\,V$

$\tau_1 = 3\,s$

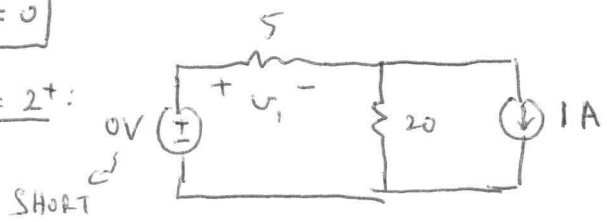
$v_1(t) = -8e^{-\frac{t}{3}} + 10, \quad 0 < t < 2$

$i(t) = -2e^{-\frac{t}{3}} + 2, \quad 0 < t < 2$

$t = 2^-$: $i(2^-) = -2e^{-\frac{2}{3}} + 2 = -2e^{-\frac{1}{1.5}} + 2 = -2 \cdot \frac{1}{2} + 2 = 1\,A$

(c) $v_s = 0$

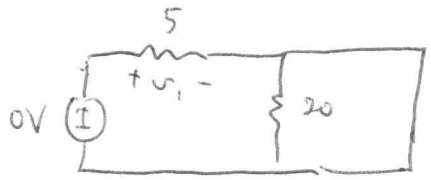
$t = 2^+$:



$i(2^+) = i(2^-) = 1\,A$

$v_1 = 1 \cdot (5 \| 20) = 1 \cdot 4 = 4\,V$

$t = \infty$:



$i(\infty) = 0$

$v_1(\infty) = 0\,V$

R_{TH}: SAME AS BEFORE $\Rightarrow \tau = 3\,s$

$A_2 = 4\,V$

$B_2 = 0\,V$

$\tau_2 = 3\,s$

$v_1(t) = 4e^{-\frac{t}{3}} + 0$