Initial conditions with DC sources and switches

\[ v_R = R I_R \]
\[ i_L = L \frac{di_L}{dt} \]
\[ v_C = C \frac{dv_C}{dt} \]

DC steady state

\[ i_L(0^-) = \frac{10}{5} = 2A \]
\[ v_C(0^-) = 10V \]

\[ v_L = 0; \quad v_C = 0 \]
Inductor is a short circuit
Capacitor is an open circuit

\[ t = 0^- \]

The switch is opened at \( t = 0 \)

\[ t = 0^+ \]

\[ v_L = L \frac{di_L}{dt} \]
\[ v_C = C \frac{dv_C}{dt} \]
*Current thru an inductor cannot change abruptly*
*Voltage across a capacitor cannot change abruptly*

**Problem 1**

\[ i_L(0^+) = i_L(0^-) = 2A \]
\[ v_C(0^+) = v_C(0^-) = 10V \]
\[ i_C(0^+) = 2A \]
\[ v_L(0^+) = 10 - 14 = -4V \]

**Problem 2**

At \( t = 0^- \)

\[ v_L(0^-) = 0; \quad i_C(0^-) = 0; \]
\[ i_L(0^-) = 2A; \quad v_C(0^-) = 4V \]
At $t = 0^+$

$v_L(0^+) = 4V$ \hspace{0.5cm} $i_C(0^+) = -1A$ \hspace{0.5cm} 8V

$i_L(0^+) = 2A$ \hspace{0.5cm} $v_C(0^+) = 4V$

$v_L(0^-) = 4V$ \hspace{0.5cm} in parallel \hspace{0.5cm} with the 4V Source

Mesh Equation:

$-8 + 2i_1 + 4 + 2i_1 = 0$

$\Rightarrow i_1 = 1A$

Also:

$i_1 - i_2 = 2A$ \hspace{0.5cm} $i_2 = i_1 - 2 = -1A = i_C(0^-)$