Discussion Notes - 1

**Eq 1:** KCL (Kirchhoff's Current Law) Find \( i_3 \)

\[
\begin{align*}
5A & = i_1 \\
2A & = i_2 \\
1A & = i_4
\end{align*}
\]

**KCL:** \( i_1 + i_2 + i_4 = i_3 \)

\[
\begin{align*}
i_3 & = 8A & (KCL) \quad \text{(1)}
\end{align*}
\]

**KCL:** \( i_1 + i_2 + i_4 + i_3 = 0 \)

**Correct:** \( i_3 = ? \)
\[ i_3 = - (i_1 + i_2 + i_4) \]

\[ i_3 = -8A \]  \[ \text{Equation 2} \]

Compare (1) & (2). Magnitude of \( i_3 \) is the same (8A) but sign is different. This is because, in Eq. 2, all currents are drawn as entering the point A, which is not physically possible. Therefore, \( i_3 \) in Eq. 2 is negative because \( i_1, i_2, \) & \( i_4 \) are fixed/positive.
Equation 3: \( (10V) \)

\[ \text{KVL: } \sum (\text{voltage around a loop}) = 0 \]

Note: \( V = 12V \)

\[ V_{ab} = 12V \]

\( V_{bc} = 10V \)

(2) GND \( V_{cc} \) yet really does not matter in the sense that potential differences are important.
Find $V_{ca0}$?

Now, $V_{ca0} = 2V$

$\Rightarrow V_{c} - V_{ca0} = 2V \Rightarrow V_{ca0} = V_{c} - 2$

$\Rightarrow V_{ca0} = 10V$

$V_{cb} = V_{ca} - V_{b} = 10V$

$V_{cb} = 12V$

$\Rightarrow V_{c} - V_{b} = 12V$

$\Rightarrow V_{c} = 12V$
But suppose:

\[ V_{ab} = V_a - V_b = 0 - (-10) = 10 \text{ V} \]
Notice V_{ab} did not change!!!, because of KVL:

\[ V_{ab} = 12 - 2 = 10 \, V \]

Going clockwise from b:

\[ +V_{cs} - V_{ca} - V_{cb} = 0 \]

Note: V_{cb} means plus at c & minus at b i.e.,

\[ V_{cb} = V_c - V_b \]

- Rise in potential
- Drop in potential

**Convention**
Note: If my convention was "opposite": \(-12 + 2 + V_{ab} = 0\)

\[ V_{xy} = 10 \, V \]

\[ V_a - V_b = -2 \]

\[ V_b - V_a = +2 \]