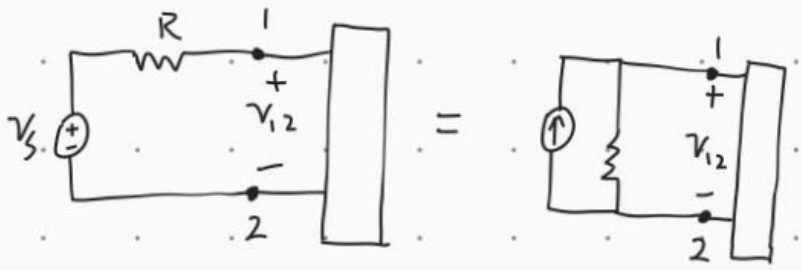
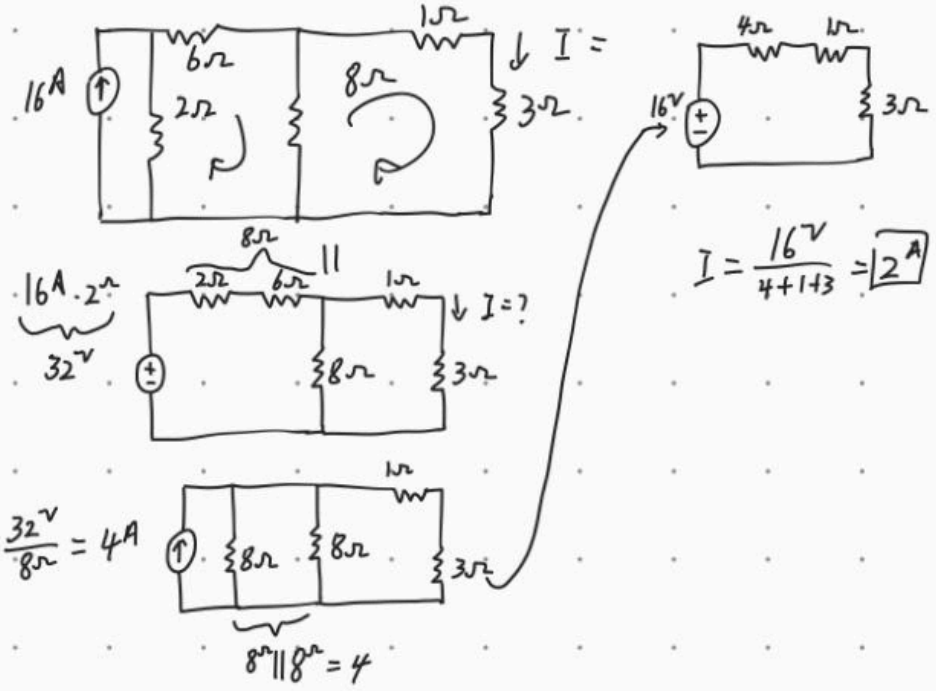
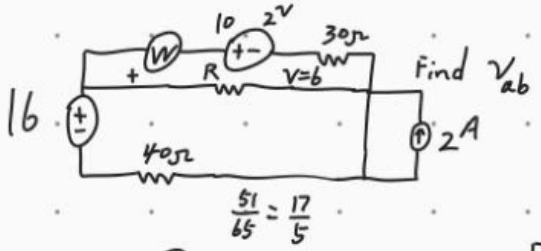
Lecture 6



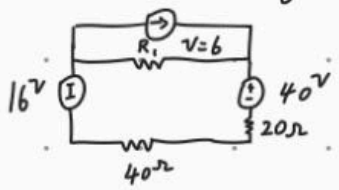
$$V_S = R_T \cdot I_S$$

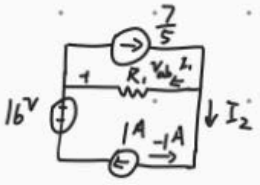
Source Transformation:





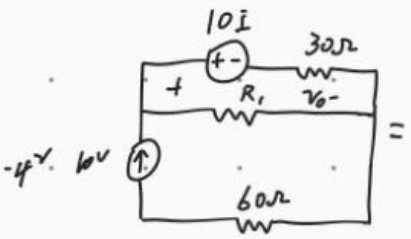
$\frac{51}{65} = \frac{17}{5}$





$I_2 = IA$

$I_1 = \frac{12}{5} = 2.4$



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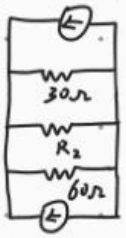
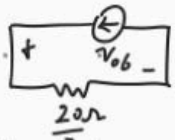


$R_L = 10\Omega$

$30 \| 0 = \frac{30 \cdot 60}{390} = 20\Omega$

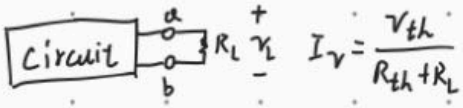
$\frac{20(10)}{30} = \boxed{\frac{20}{3}\Omega}$

$\frac{24}{60} = -\frac{4}{10}A = \boxed{-0.4A}$

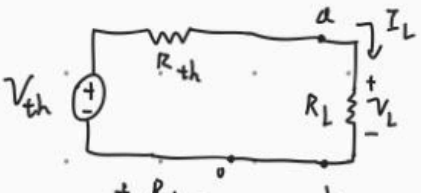


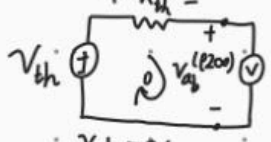
$$I = \frac{20\Omega}{20\Omega + 10\Omega}(3) = \boxed{2A}$$

Thevenin's Theorem: Any linear circuit can be replaced by a voltage source and resister in series.

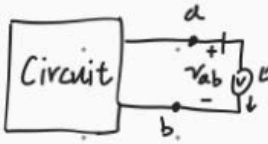


$$I_V = \frac{V_{th}}{R_{th} + R_L}$$



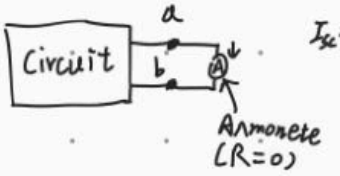


$V_{ab} = V_{th}$

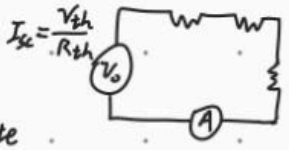


voltage source (R = ∞)

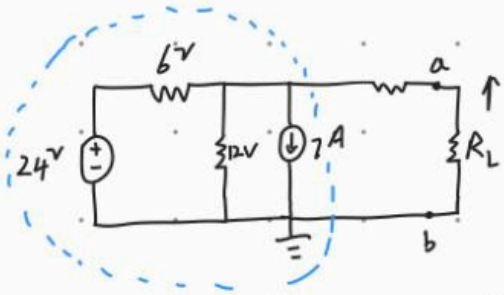
Open circuit voltage.



$I_{sc} = \frac{V_{th}}{R_{th}}$



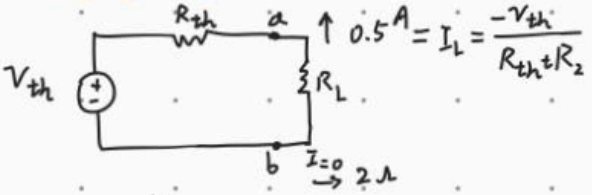
$$R_{th} = \frac{V_{oc}}{i_{sc}}$$



$I_L = 0.5A$ $\quad R_L = ?$

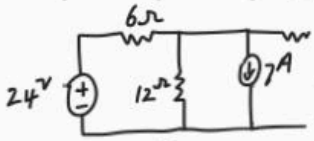
$I_L = 0.5A = \frac{-(-12)}{6 - R_2} = R_L$

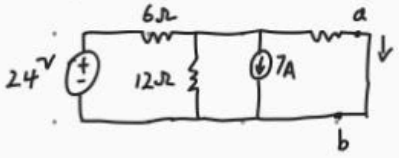
$= 18\Omega$



$0.5^A = I_L = \frac{-V_{th}}{R_{th} + R_2}$

$I = 0$ → 2Ω



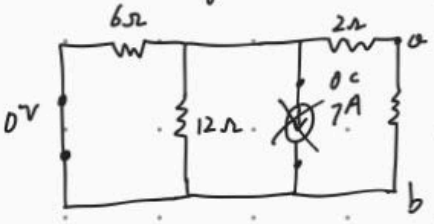


$I_x \rightarrow R_{th} = \frac{V_{o+}}{I_{sc}}$

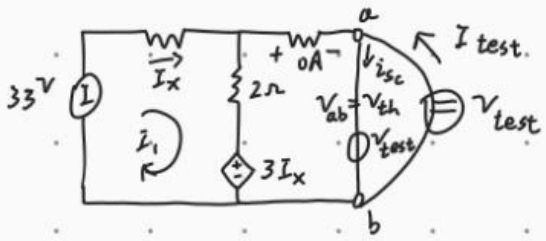
$R_{th} = \frac{-12V}{6V} = -2\Omega$

$\frac{V_y - 24}{6} + \frac{V_y}{12} + 7 + \frac{V_y}{2} = 0$

$= V_y = \cdots\cdots = -4^V \rightarrow I_{sc} = \frac{V_y}{2\Omega} = \frac{-4}{2\Omega} = -2^A$



$(6^\Omega \| 12^\Omega) + 2 = 6^\Omega$



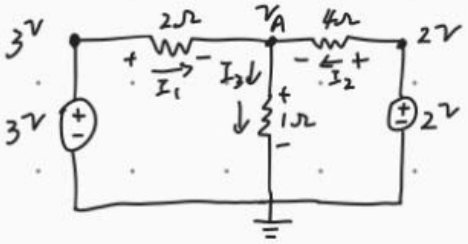
$R_{eq} = R_{th} = \frac{V_{test}}{i_{test}}$

$V_{th} = V_{oc}$

$-33 + 6I + 2I_1 + 3I_1 = 0$ ($3I_1 \rightarrow 3I_x$)

$\| I_1 = 33$ $\quad \boxed{I_1 = 3}$

$V_{ab} = V_{th} = 2I_1 + 3I_x = 5I_1 = 5 \times 3 = 15^V$ $\quad V = IR$; $I = \frac{V}{R}$



KCL: $I_3 - I_1 - I_2 = 0$

$$V_g - \frac{3V_A}{2\Omega} - \frac{2V_A}{4\Omega} = 0$$

$$\frac{V_a - 0}{1\Omega} - \frac{3^V - V_a}{2\Omega} - \frac{2^V - V_a}{4\Omega} = 0$$

$$4V_g - 6^V + 2V_a - 2^V + V_a = 0$$

$$7V_a = 8^V$$

$$V_a = \frac{8}{7}V$$