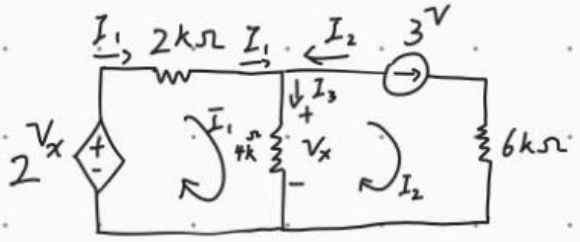
Lecture 5



V kΩ mA

$V = RI$

$I_3 = I_1 - I_2$

$P = IV = ?$ (2kΩ)

mesh current

V_x

kVL 1: $-2V_x + 2\Omega\, I_1 + 4^k(I_1 - I_2) = 0$

V_x

kVL 2: $3^V + 6^k I_2 - 4^k(I_2 - I_1) = 0$

$V_x = f(I_1, I_2) = 4^k(I_1 - I_2)$

$-2V_x + 2^k\Omega I_1 + V_x = 0$

$I_1 = 8^{mA}$

$I_2 = 1.5^{mA}$

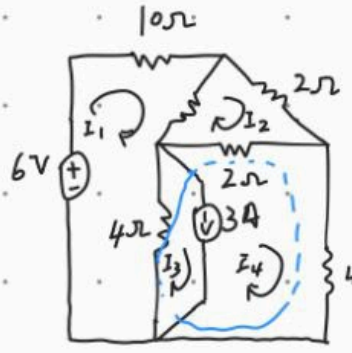
$-V_x + 2^k\Omega I_1 = 0$

$V_x = -2^k\Omega I_1$

$V_x = 4^k(3.5) = 14$

$P = (3.5)(14) = 49^W$

$P = 4^{k\Omega}(1.5mA)^2 = 9mW$



$(1) = -6 + 10I_1 + 2(I_1 - I_2) + 4(I_2 - I_3) = 0$

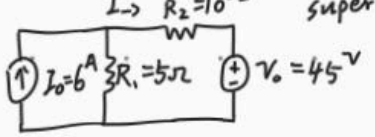
$(2) = 2I_2 + 2(I_2 - I_4) + 2(I_2 - I_1) = 0$

$(3) = 4(I_3 - I_1) + ? = 0$

$(4) = 4I_4 + 2(I_4 - I_2) = ? = 0$

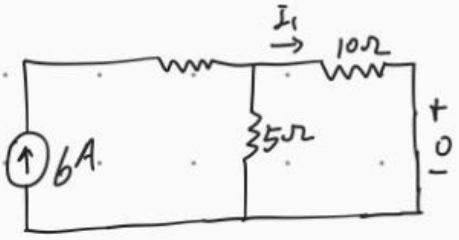
$4(I_3 - I_1) + 2(I_4 - I_2) + 4I_4 = 0$

when there is a current source then you have a super mesh. $3^A = I_4 - I_3$



super position:

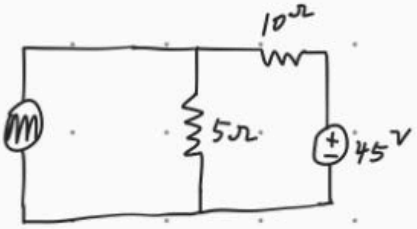
$I = I_1 + I_2 = 1$

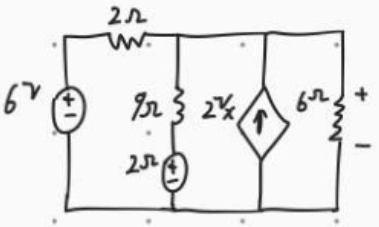


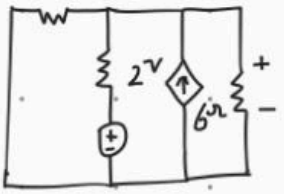
$$I_1 = \left(\frac{5\Omega}{5\Omega + 10\Omega}\right) 6 = \boxed{2\,A}$$

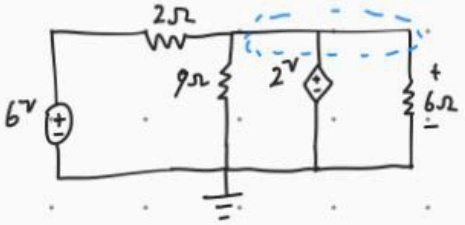
$$I_2 = \frac{-45}{5\Omega + 10\Omega} = \boxed{-3A}$$

open circuit









use short circuits for voltage sources

use open circuits for current

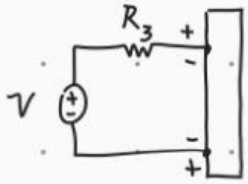
$$\frac{V_{x_1} - 0}{2} + \frac{V_{x_2} - 2}{3\Omega} + \frac{V_o - 0}{9\Omega} = 0$$

$$V_{x_1} = -2 \cdot 45\Omega$$

$$\frac{V_{x_2} - 6}{2\Omega} + \frac{V_{x_2}}{9} - 2^V \cdot X_2 +$$

$$V_x = V_{x_1} + V_{x_2} = -2.45 -$$

Source Transformation



Practical Source

$$\text{KVL}: -V_6 + R_3 i + V_1 i = 0 \quad j - I_5 + \frac{V_{12}}{R_5} - i = 0$$

$$\frac{V_3 - V_{12}}{R_5} = i \qquad i = I_5 - \frac{V_{12}}{R_2}$$

$$\frac{V_1}{R_5} - \frac{V_{12}}{R_5} = i$$