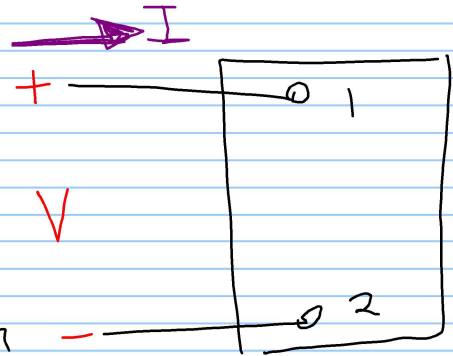


chapter 1

Voltage, Current }
power, Energy }

Passive Sign Convention

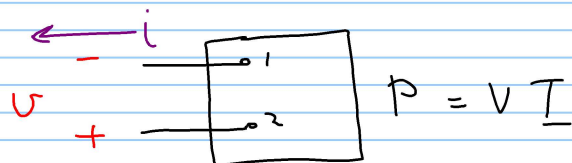
uses a +ve sign in the expression that relates the voltage & current at the terminals of an element when the reference direction for the current through the element is in the direction of the reference voltage drop across the element

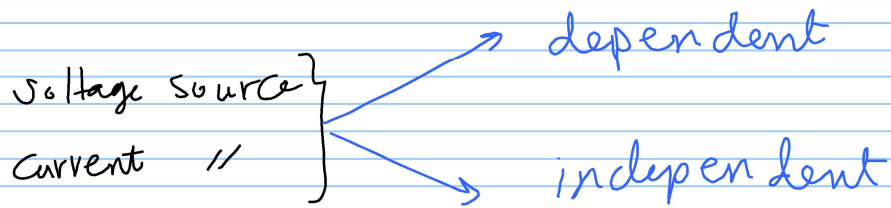


$$\boxed{P = VI} \quad \text{OR} \quad \boxed{P = -VI} \quad \text{Watts}$$

→ if $P > 0$, Power is being delivered to the circuit or circuit component. (element is absorbing power)

→ if $P < 0$, Power is being extracted from the circuit or circuit component. (element is delivering power)

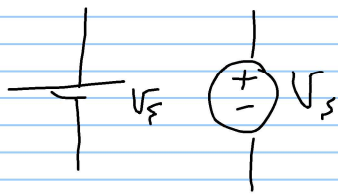


chapter 22.1 Voltage & current sources

→ Independent → its value is not influenced by any other current or voltage in the circuit
 Ideal sources

→ dependent → its value is determined by some other current or voltage in the circuit

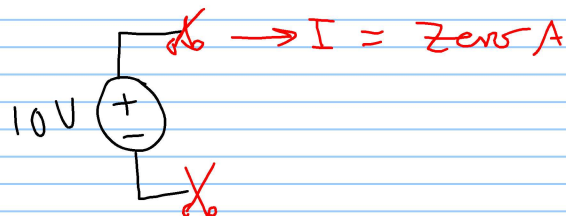
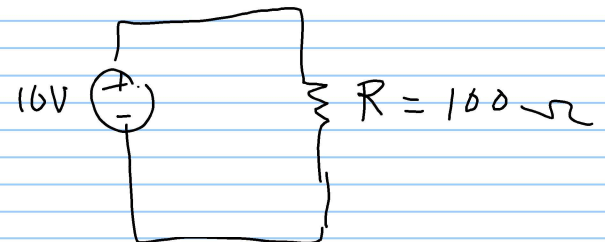
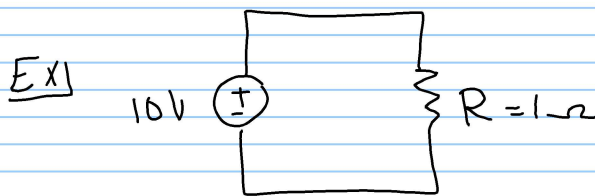
Ideal Voltage Source maintain a prescribed voltage, regardless of the current in the device



Ideal indep. voltage source

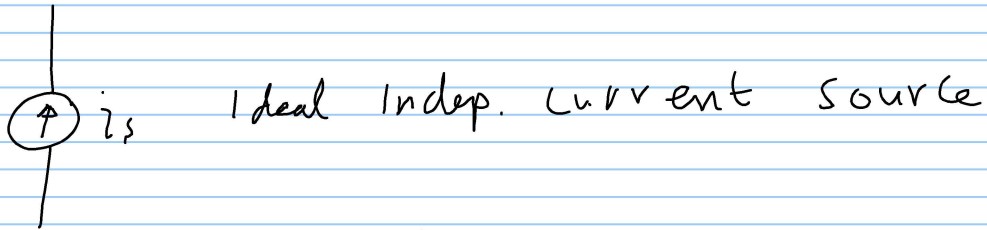
→ $I = \frac{10}{1} \text{ A}$

→ $I = \frac{10}{100} \text{ A}$

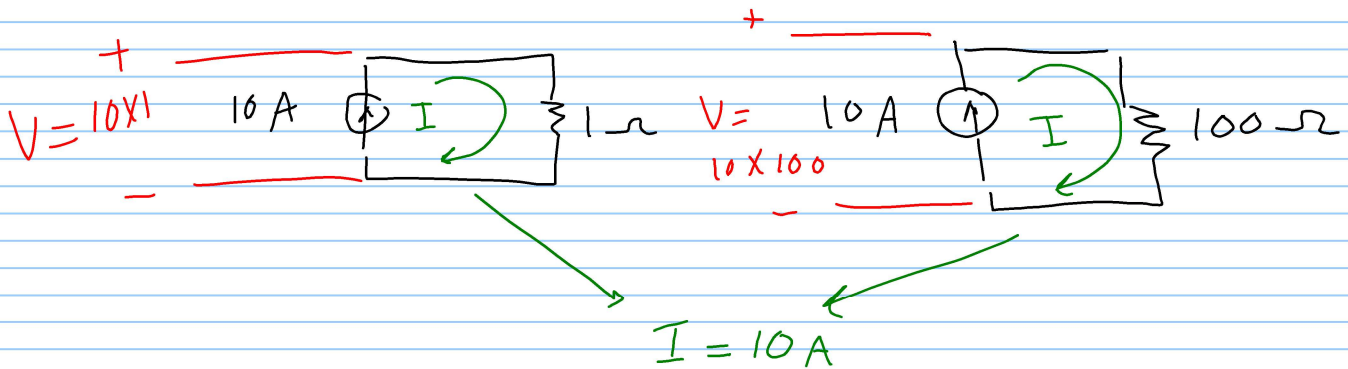


Ideal current source

maintain a prescribed current, regardless of the voltage in the device



EX)



dependent sources

controlled sources



$$v_s = \mu v_x$$

Ideal dep. voltage-controlled voltage source



$$i_s = \rho i_x$$

Ideal dep. current-controlled current source



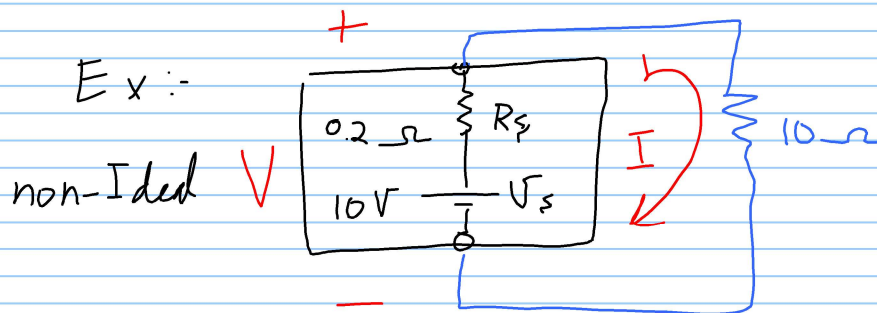
$$i_s = \alpha v_x$$

Ideal dep. Voltage - controlled current source



$$i_s = \beta i_x$$

Ideal dep. Current - controlled current source

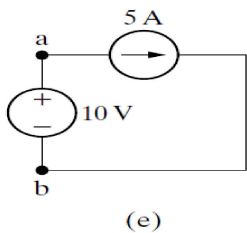
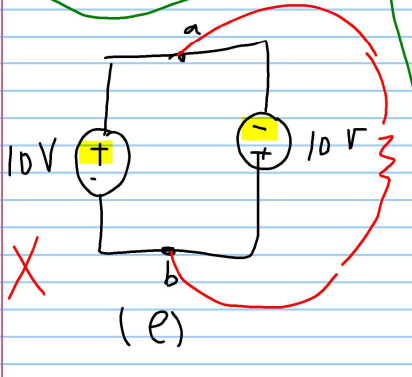
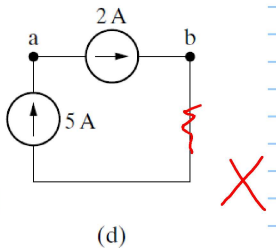
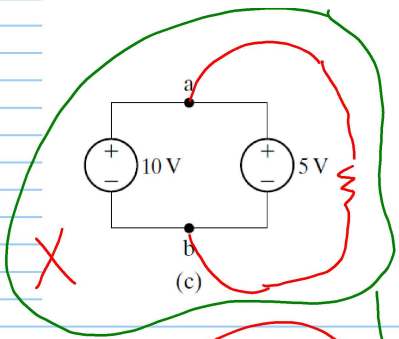
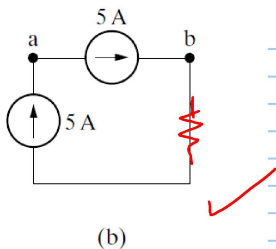
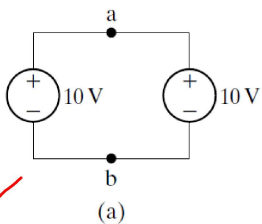


$$I = \frac{V_s}{10 + 0.2} = \frac{10}{10.2} = 0.98 \text{ A}$$

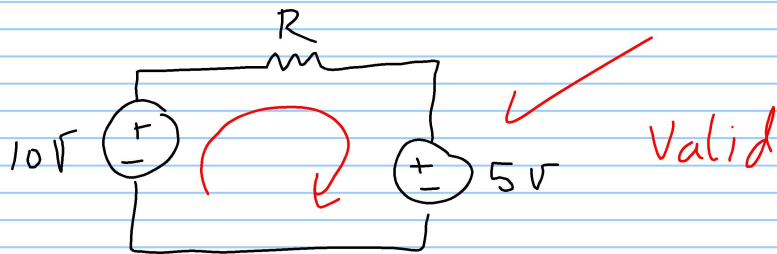
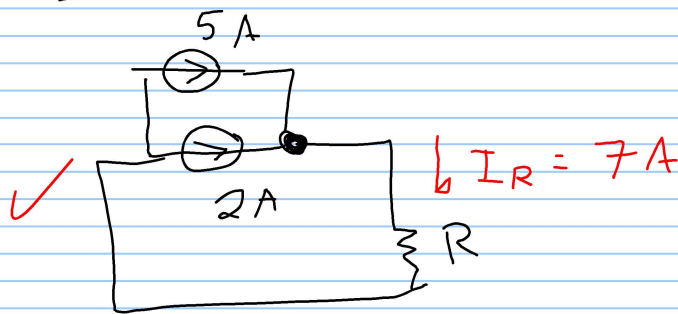
$$\begin{aligned} \infty V &= V_s - 0.2 \times 0.98 \\ &= 10 - 0.196 = +9.804 \text{ Volt.} \end{aligned}$$

Example 2.1 Testing Interconnections of Ideal Sources

Using the definitions of the ideal independent voltage and current sources, state which interconnections in Fig. 2.3 are permissible and which violate the constraints imposed by the ideal sources.

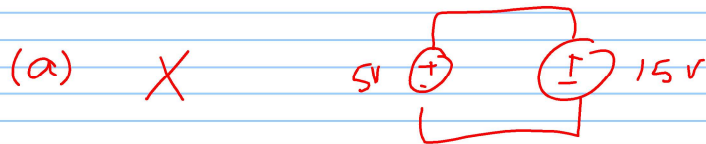


EX1



Example 2.2 Testing Interconnections of Ideal Independent and Dependent Sources

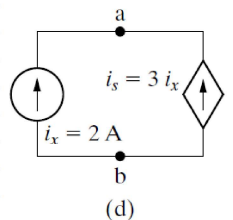
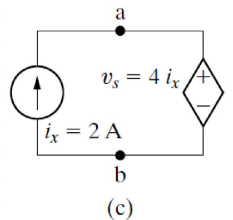
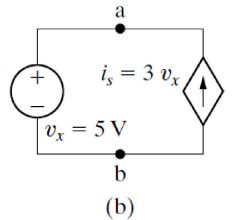
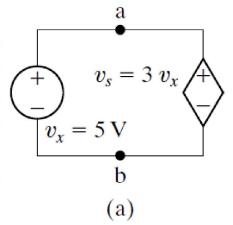
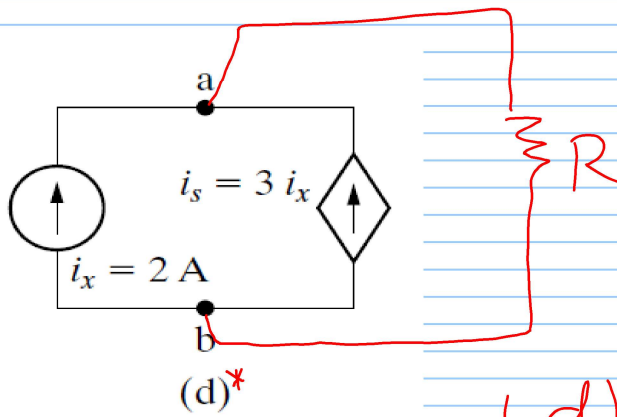
Using the definitions of the ideal independent and dependent sources, state which interconnections in Fig. 2.4 are valid and which violate the constraints imposed by the ideal sources.



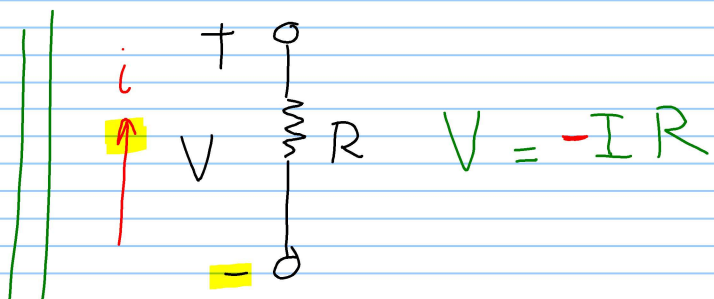
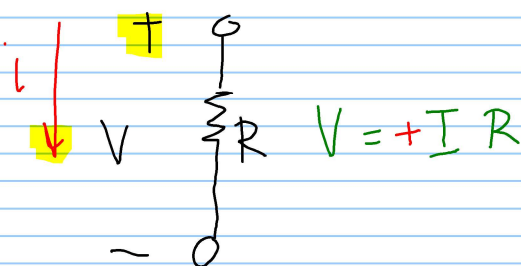
(b) ✓

(c) ✓

(d) X



2.2. Electrical Resistance (ohm's law)

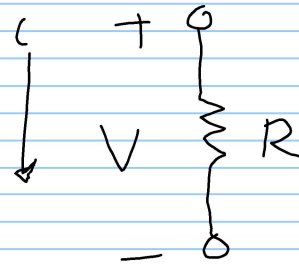


→ Conductance G :-

~~$$R = \frac{P}{A}$$~~

$$G = \frac{1}{R} \text{ , } \underline{\underline{\Omega \text{ OR } \text{S}}}$$

→ $P = \underline{V} i$
 $= (i R) i$
 $\boxed{P = i^2 R}$, W
 (+ve)

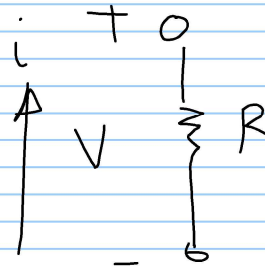


$$P = V i$$

$$= V \left(\frac{V}{R} \right)$$

$$\boxed{P = \frac{V^2}{R}}$$

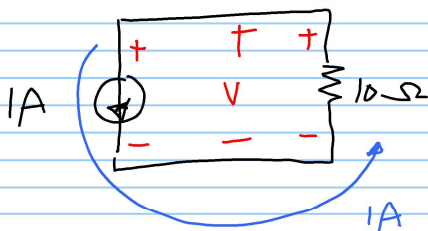
→ $P = - \underline{V} i$
 $= - (-i R) i$
 $= i^2 R$ (+ve)!



$$\boxed{P = \frac{V^2}{R}}$$

∴ The resistors (ONLY) absorbs power from the circuit !

EX1



find V sol

$$* V = - (1A)(10-\Omega)$$

$$= -10V$$

$$P_R = i^2 R = 10W = \frac{V^2}{R}$$

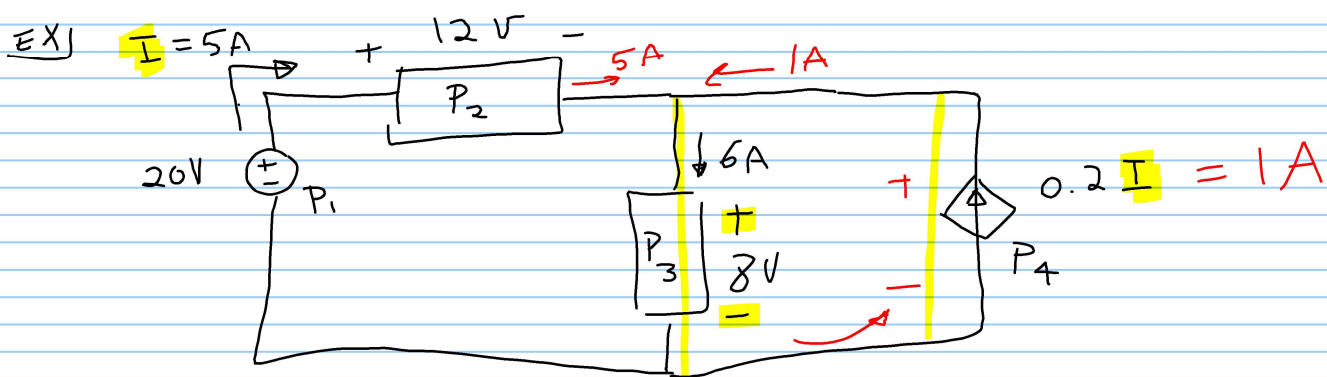
OR $* P_R = -V I = -(-10)(1) = 10W$ (absorbed)

$$* P_{1A} = VI = (-10)(1) = -10W \text{ (delivered)}$$

∴ The algebraic sum of power in a circuit at any time must be zero

$$\sum P(H) = \text{Zero}$$

$$\text{OR } \sum P_{\text{absorbed}} = \sum P_{\text{delivered}}$$



Calculate the power supplied or absorbed by each element

$$\underline{\text{sol}}$$

$$P_1 = -(20)(5) = -100W \text{ (supplied (delivered))}$$

$$P_2 = +(12)(5) = 60W \text{ (absorbed)}$$

$$P_3 = +(8)(6) = 48W \text{ (//)}$$

$$P_4 = -(8)(0.2 \times 5) = -8W \text{ (supplied)}$$

$$\sum P_{\text{abs.}} = \sum P_{\text{supp.}}$$

$$\underline{\underline{60 + 48}} = \underline{\underline{100 + 8}}$$