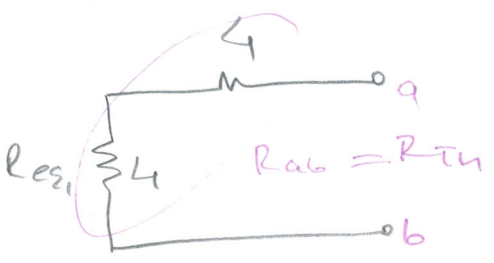
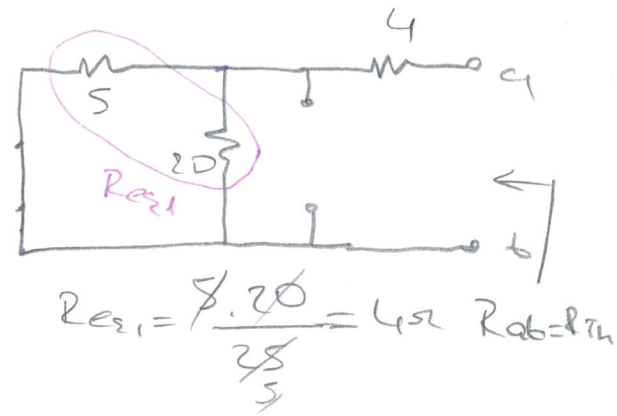
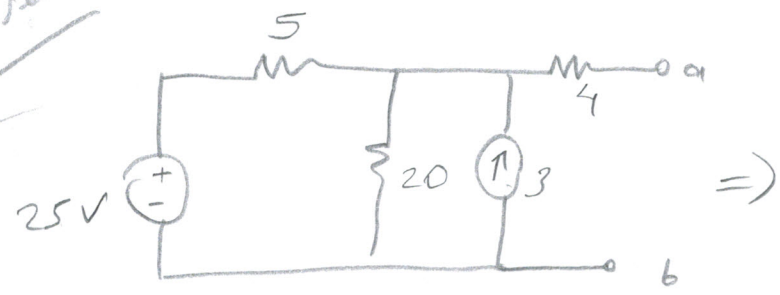


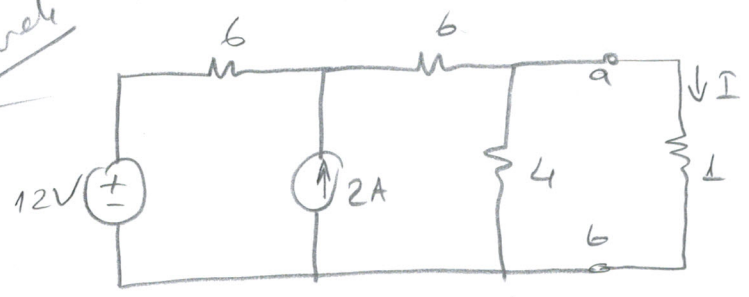
* R_{Th} 'i bulmak için diğer bir kolay yol; eğer devre bğımsız kaynaklardan oluşuyorsa, gerilim kaynakları kısa devre, akım kaynakları açık devre yapıp eşdeğer direnci bulunur.

Örnek



$R_{Th} = 4 + 4 = 8 \Omega$

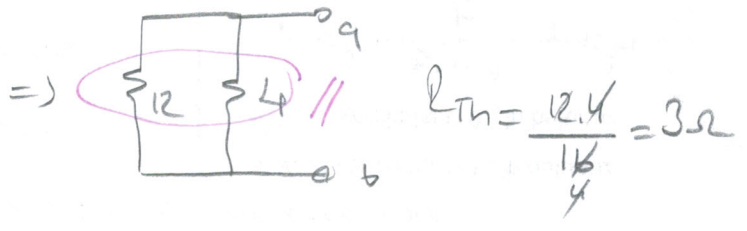
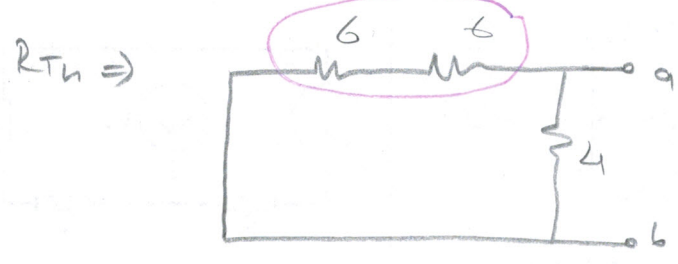
Örnek



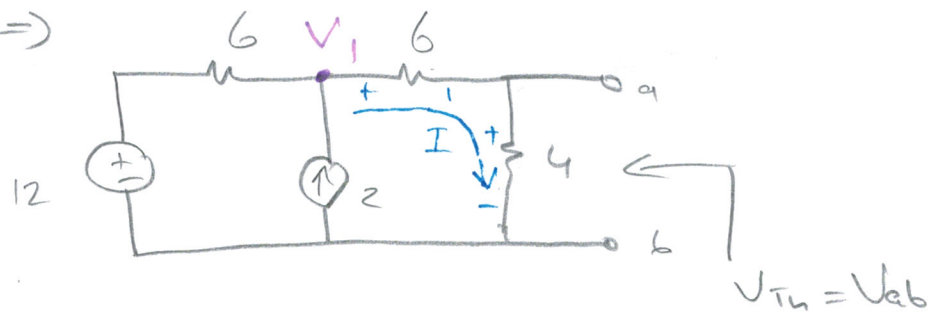
ab noktasının sol tarafında kalan devrenin Thevenin eşdeğer devresini bulunuz. Ardından I akımını bulunuz

R_{Th} ? V_{Th} ?

$R_{ser} = 6 + 6 = 12$



$V_{Th} \Rightarrow$

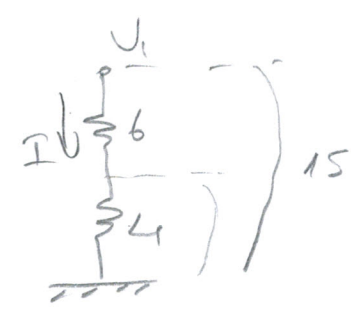


$$\frac{V_1 - 12}{6} - 2 + \frac{V_1}{10} = 0$$

$$10V_1 - 120 + 6V_1 = 120$$

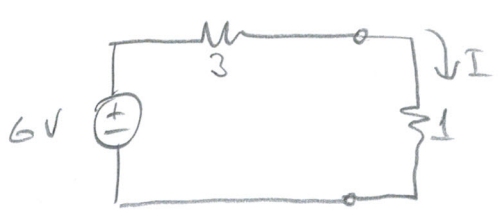
$$16V_1 = 240$$

$$V_1 = 15V$$



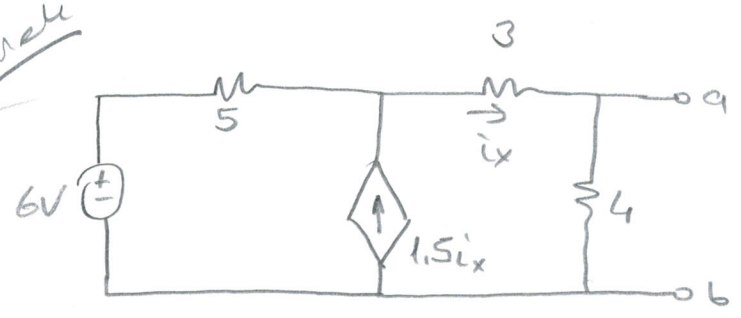
$$I = \frac{15}{10} = 1.5A$$

$$V_{ab} = 4 \cdot 1.5 = 6V$$



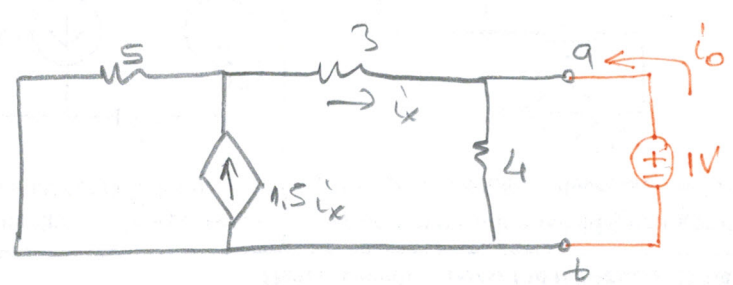
$$I = \frac{V}{R} = \frac{6}{3+1} = 1.5A$$

Örnekle



ab uçlarından bakıldığında, görünen Thevenin eşdeğer devresini bulunuz.

$R_{Th} \Rightarrow$ Bağımsız kaynaklar elimine edilir, bağımlı kaynaklara dokunulmaz.



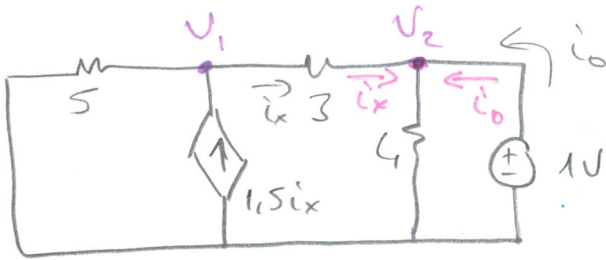
R_{Th} kolayca bulabilmek için ab uçlarına 1V'lık gerilim kaynağı bağlanır.

Bu kaynaktan çıkan akıma I_0 denir.

$$R_{Th} = \frac{1}{I_0}$$

$$V = IR$$

$$R = \frac{V}{I}$$



$$\frac{V_1}{5} - 1.5i_x + i_x = 0$$

$$V_1 = 2.5i_x$$

$$V_2 = 1V$$

$$\frac{V_1 - V_2}{3} = i_x \rightarrow \frac{V_1 - 1}{3} = i_x$$

$$V_1 = 2.5 \left(\frac{V_1 - 1}{3} \right)$$

$$3V_1 = 2.5V_1 - 2.5$$

$$0.5V_1 = -2.5$$

$$V_1 = -5V$$

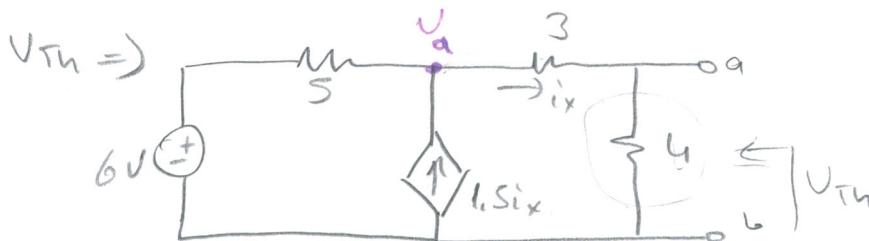
$$i_x = \frac{V_1 - 1}{3} = \frac{-5 - 1}{3} = -2A$$

2 noktası için KCL $\rightarrow -i_x + \frac{V_2}{4} - i_o = 0$

$$-(-2) + \frac{1}{4} = i_o$$

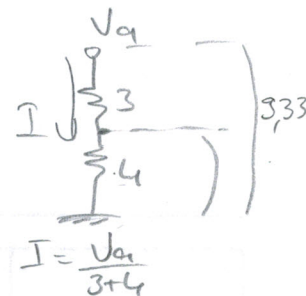
$$i_o = 9/4$$

$$R_{Th} = \frac{1}{i_o} = \frac{4}{9} \Omega$$



$$\frac{V_a - 6}{5} - 1.5i_x + \frac{V_a}{7} = 0$$

$$i_x = \frac{V_a}{7}$$



$$\frac{V_a - 6}{5} - \frac{15}{10} \frac{V_a}{7} + \frac{V_a}{7} = 0$$

(14) (10)

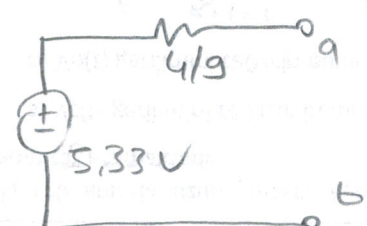
$$14V_a - 84 - 15V_a + 10V_a = 0$$

$$9V_a = 84$$

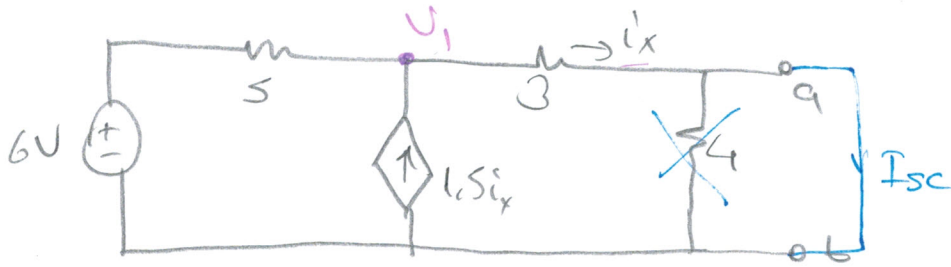
$$V_a = 9.33V$$

$$V_{Th} = V_a / (2.1) \cdot 1 = 5.33V$$

Thevenin Eşdeğer devresi



2. yol V_{Th} - sayını şelalde önce bulunur.
Sonra I_{sc} 'y' bulup R_{Th} 'i' bulunur



$$\frac{V_1 - 6}{5} - 1.5i_x + \frac{V_1}{3} = 0$$

$$i_x = \frac{V_1}{3}$$

$$\frac{V_1 - 6}{5} - \frac{15}{10} \cdot \frac{V_1}{3} + \frac{V_1}{3} = 0$$

$$6V_1 - 36 - 15V_1 + 10V_1 = 0$$

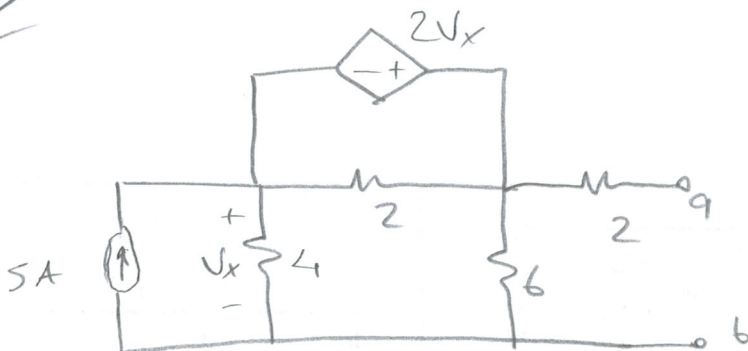
$$V_1 = 36$$

$$I_{sc} = i_x = \frac{V_1}{3} = \frac{36}{3}$$

$$= 12A$$

$$R_{Th} = \frac{V_{Th}}{I_{sc}} = \frac{5.33}{12} = 0.444 \Omega$$

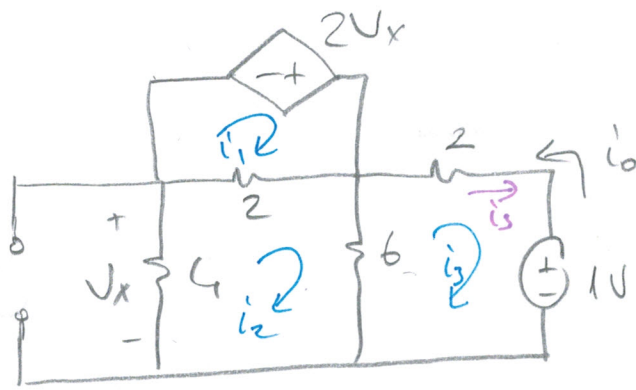
Örnek



ab uçundan görünen
 T_{H} değer deriz

$R_{Th} =$

12-5



$$i_0 = \Rightarrow R_{Th} = \frac{1}{i_0}$$

$$i_0 = -i_3$$

$$V_x = -4i_2$$

Göz 1

$$-2V_x + 2(i_1 - i_2) = 0$$

$$-2(-4i_2) + 2i_1 - 2i_2 = 0$$

$$2i_1 = -6i_2$$

$$i_1 = -3i_2$$

Göz 2

$$4i_2 + 2(i_2 - i_1) + 6(i_2 - i_3) = 0$$

$$4i_2 + 2i_2 - 2i_1 + 6i_2 - 6i_3 = 0$$

$$-2i_1 + 12i_2 - 6i_3 = 0$$

$$6i_2 + 12i_2 = 6i_3$$

$$18i_2 = 6i_3$$

$$3i_2 = i_3$$

$$i_2 = \frac{i_3}{3}$$

Göz 3

$$1 + 6(i_3 - i_2) + 2i_3 = 0$$

$$1 + 6i_3 - 6i_2 + 2i_3 = 0$$

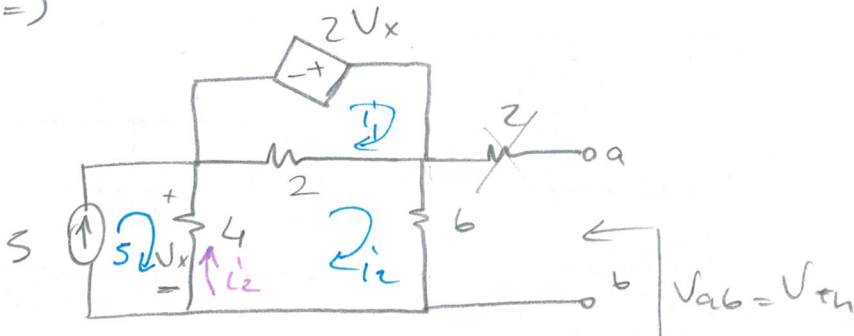
$$1 + 8i_3 - 6 \cdot \frac{i_3}{3} = 0$$

$$i_3 = -\frac{1}{6}$$

$$i_0 = -i_3 = \frac{1}{6}$$

$$R_{Th} = \frac{1}{i_0} = 6\Omega$$

$V_{Th} =$



$$V_x = 4 \cdot (5 - i_2)$$

$$\text{Göz 1} \rightarrow -2V_x + 2(i_1 - i_2) = 0$$

$$-2(20 - 4i_2) + 2i_1 - 2i_2 = 0$$

$$-40 + 8i_2 + 2i_1 - 2i_2 = 0$$

$$6i_2 + 2i_1 = 40$$

$$\text{Göz 2} \Rightarrow 6i_2 + 4(i_2 - 5) + 2(i_2 - i_1) = 0 \quad (12 - 6)$$

$$6i_2 + 4i_2 - 20 + 2i_2 - 2i_1 = 0$$

$$12i_2 - 2i_1 = 20$$

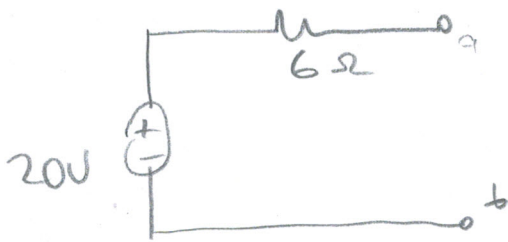
$$12i_2 - 2i_1 = 20$$

$$6i_2 + 2i_1 = 40$$

$$18i_2 = 60$$

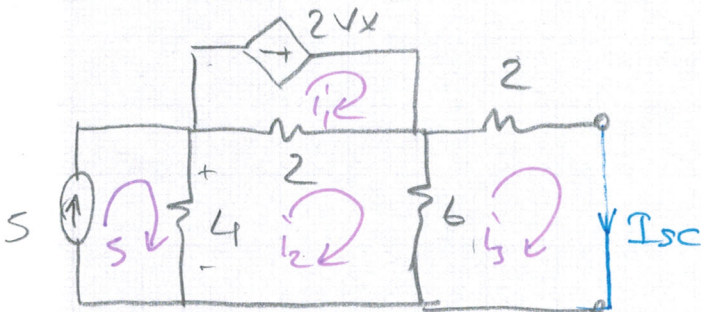
$$i_2 = 3.33 \text{ A}$$

$$V_{Th} = 6 \cdot i_2 = 20 \text{ V}$$



2. yal R_{Th} için

Önce V_{Th} bulunur.
Sonra I_{sc} "



$$\text{Göz 1} \Rightarrow -2V_x + 2(i_1 - i_2) = 0$$

$$6i_2 + 2i_1 = 40$$

$$i_3 = I_{sc}$$

$$V_x = 4(5 - i_2)$$

Göz 2

$$4(i_2 - 5) + 2(i_2 - i_1) + 6(i_2 - i_3) = 0$$

$$4i_2 - 20 + 2i_2 - 2i_1 + 6i_2 - 6i_3 = 0$$

$$12i_2 - 2i_1 - 6i_3 = 20$$

$$\text{Göz 3} \Rightarrow 2i_3 + 6i_3 - 6i_2 = 0$$

$$8i_3 = 6i_2$$

$$4i_3 = 3i_2$$

$$8i_3 + 2i_1 = 40$$

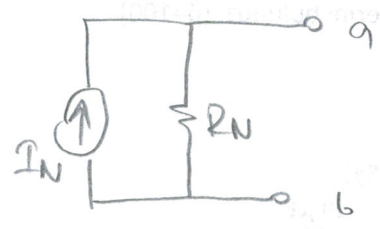
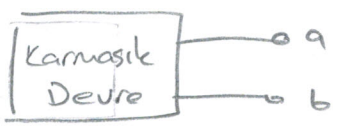
$$16i_3 - 2i_1 - 6i_3 = 20$$

$$10i_3 = 20$$

$$i_3 = 2 \text{ A} = I_{sc}$$

$$R_{Th} = \frac{V_{Th}}{I_{sc}} = \frac{20}{2} = 10 \Omega$$

3.4.2) Norton Esdeğer Devresi:

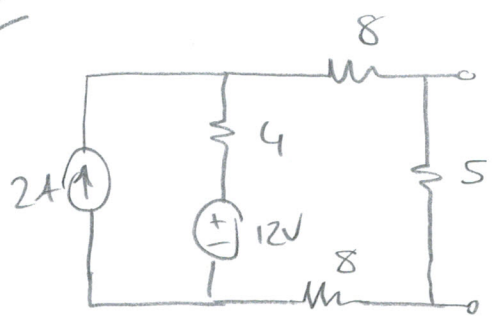


$$R_N = R_{Th}$$

$$I_N = \frac{V_{Th}}{R_{Th}}$$

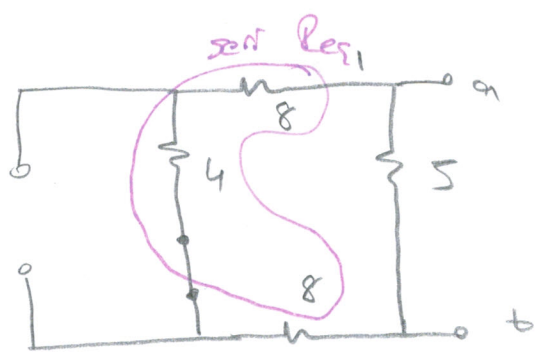
$$I_N = I_{sc}$$

Örnek

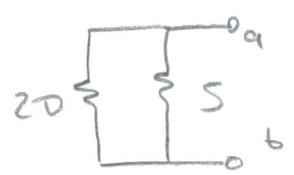


Norton esdeğer devresini bulunuz

$R_N \Rightarrow$



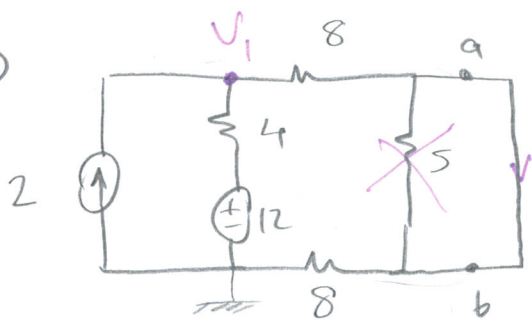
$$R_{eq1} = 8 + 4 + 8 = 20 \Omega$$



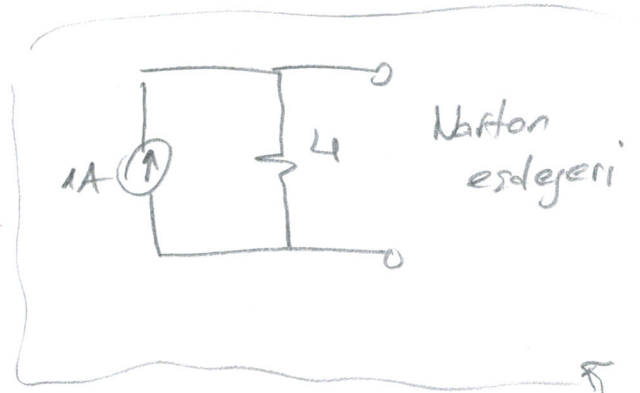
$$R_N = \frac{20 \cdot 5}{20 + 5}$$

$$R_{Th} = R_N = 4 \Omega$$

$I_N \Rightarrow$



$$I_N = I_{sc}$$



Norton esdeğeri

$$-2 + \frac{V_1 - 12}{4} + \frac{V_1}{16} = 0 \Rightarrow -32 + 4V_1 - 48 + V_1 = 0$$

$$5V_1 = 80$$

$$V_1 = 16 V$$

$$I_N = I_{sc} = 16/4 = 4 A$$