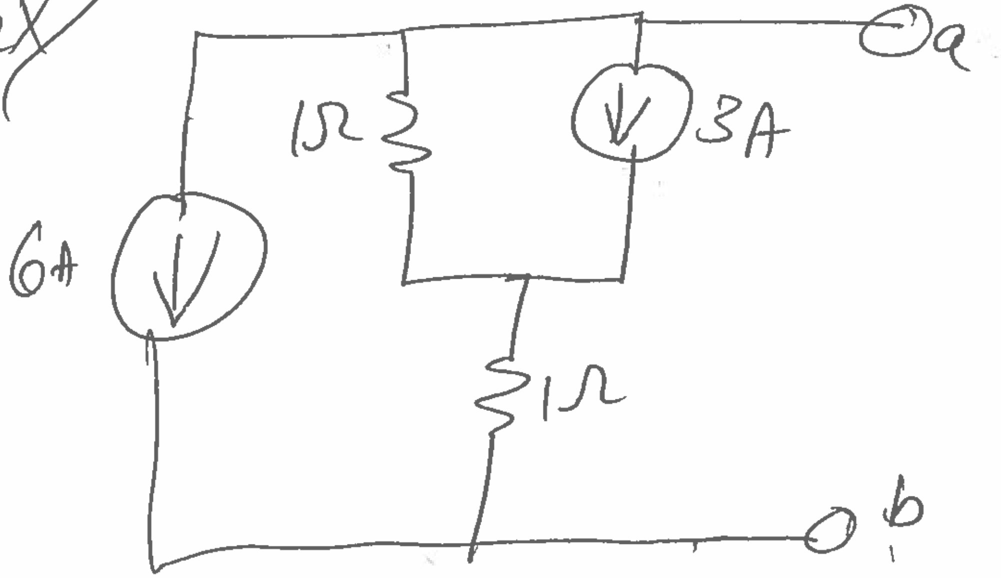
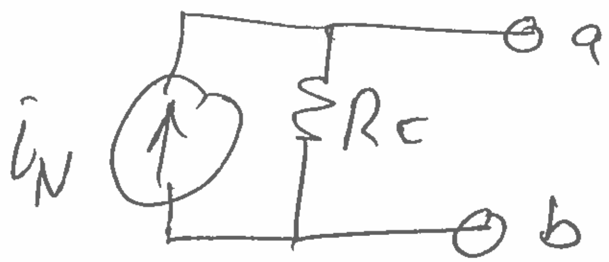
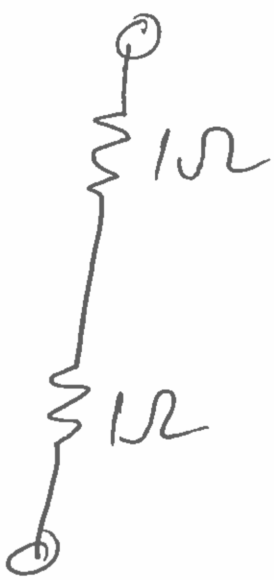
ex

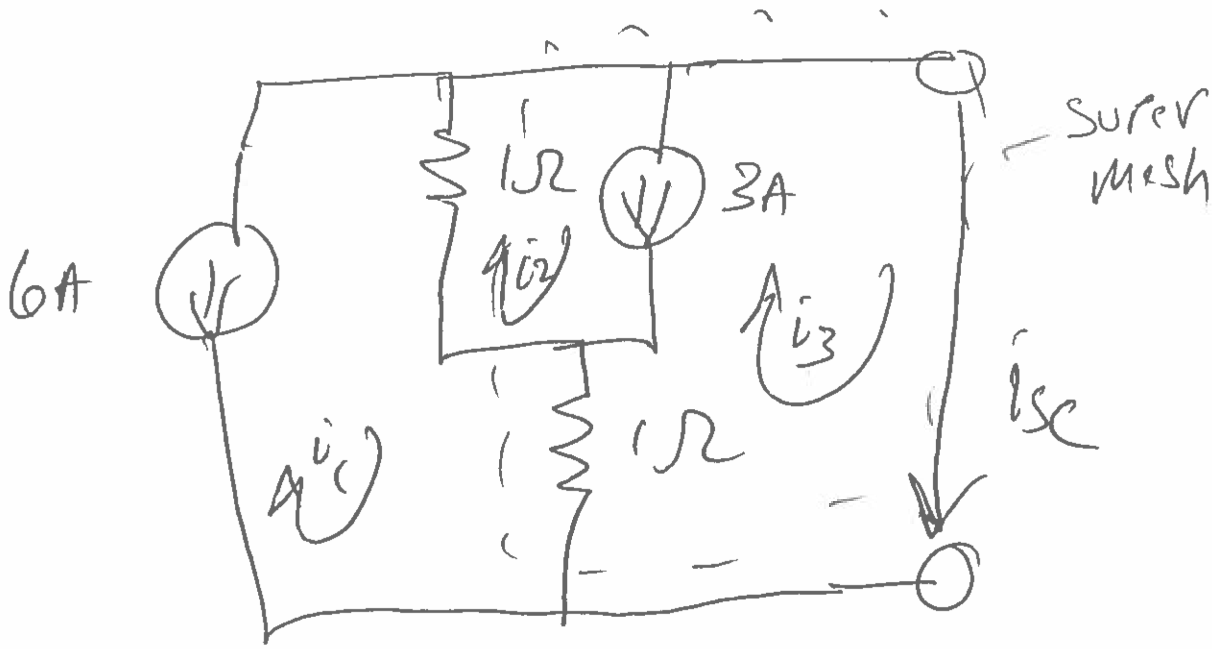




Deactivate Power



$\Rightarrow R_T = 2\Omega$



$$i_1 = -6\,A$$

$$i_2 - i_3 = 3\,A$$

$$i_2(1\Omega) + i_3(1\Omega) - i_1(1\Omega + 1\Omega) = 0$$

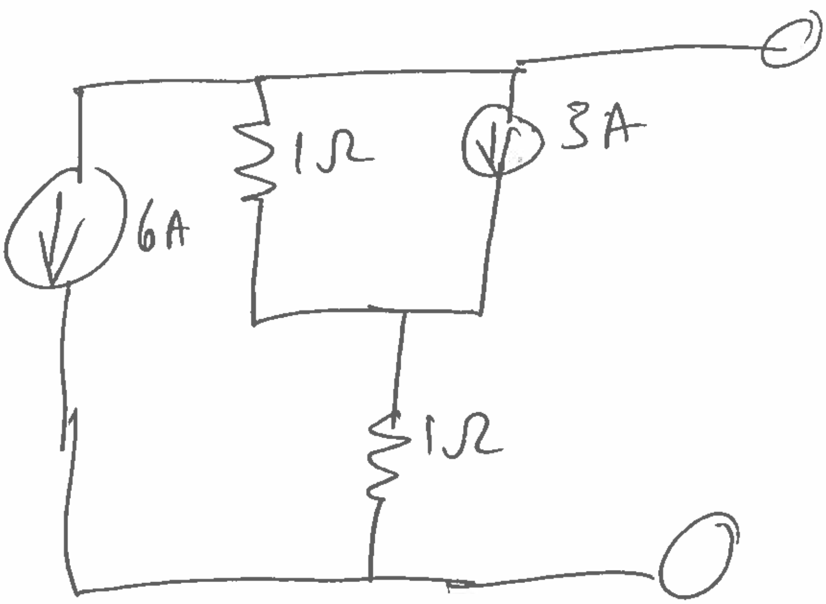
$$i_2 + i_3 = (-6\,A(2\Omega)) = -12$$

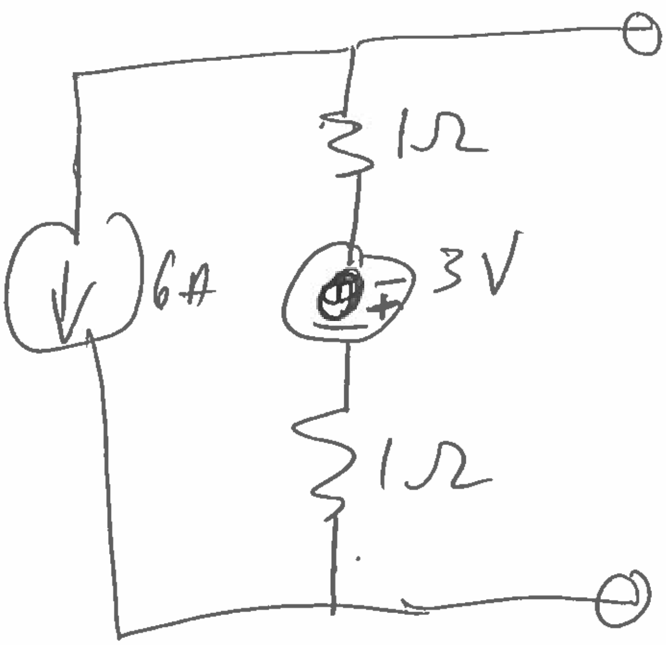
$$i_2 + i_3 = -12\,A$$
$$-(i_2 - i_3 = 3\,A)$$

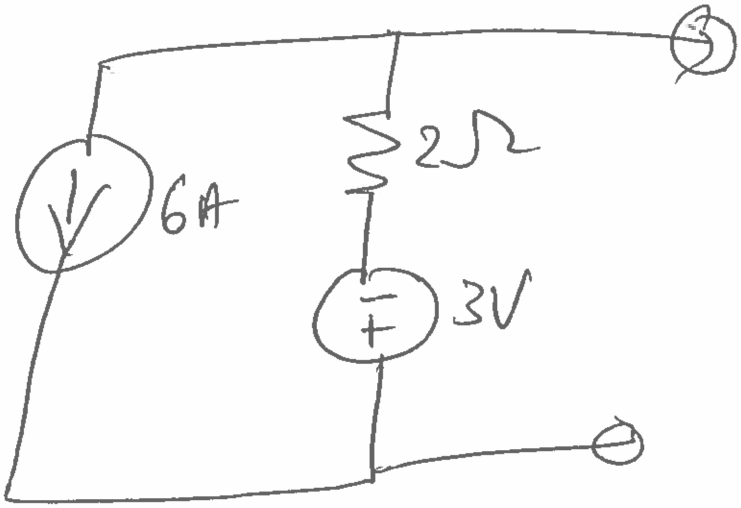
$$2 i_3 = -15\,A$$

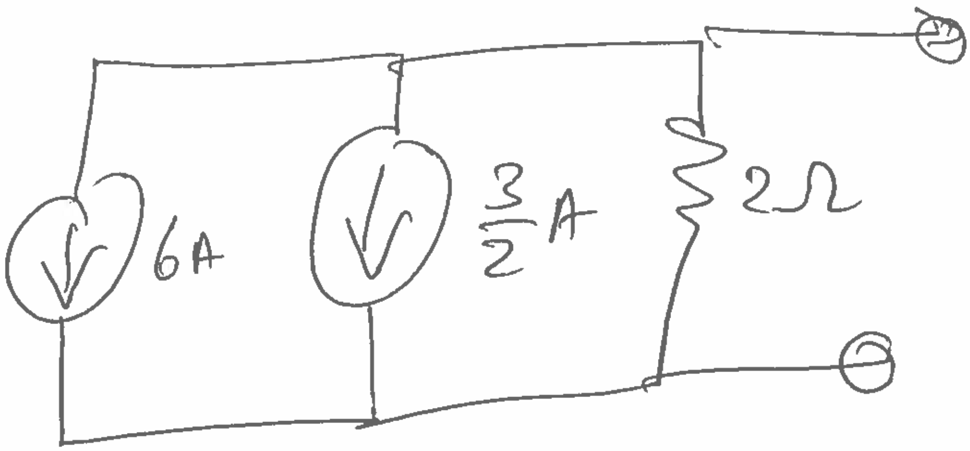
$$\Rightarrow i_3 = -7.5\,A$$

Norton



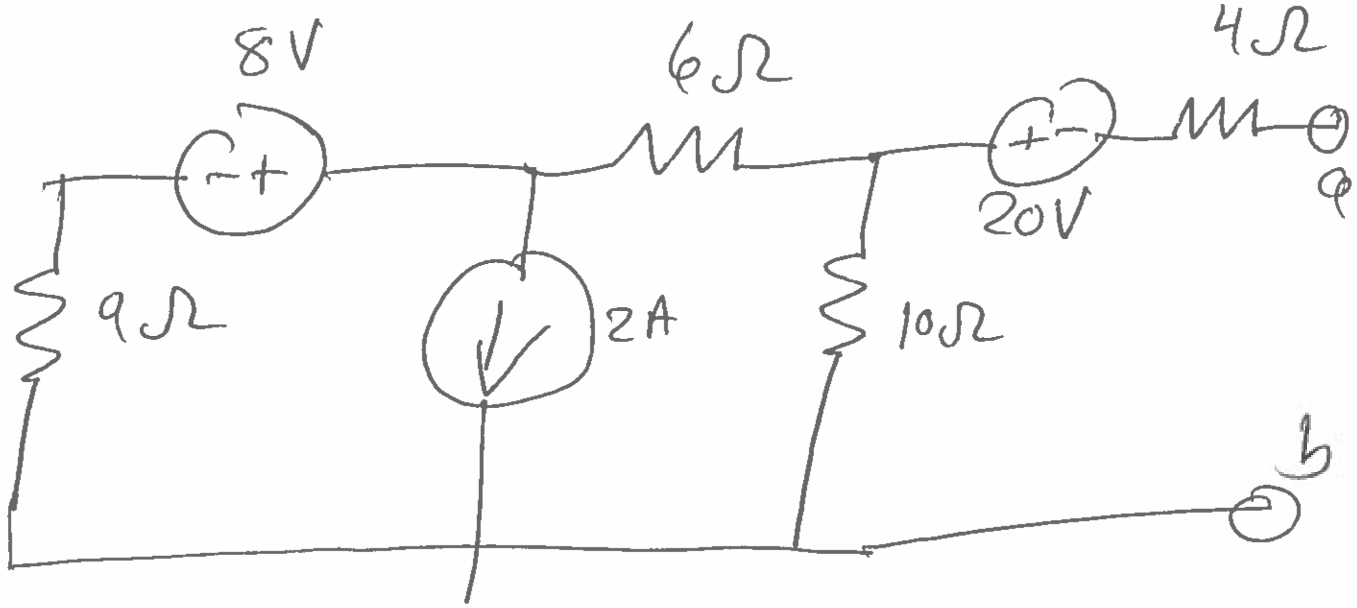



6A
2Ω
3V


6A
3/2 A
2Ω

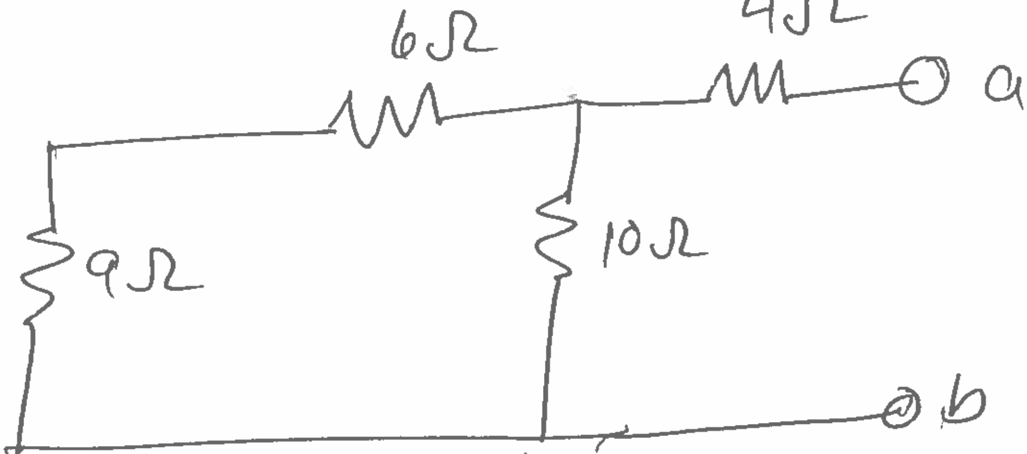

7,5A
2Ω

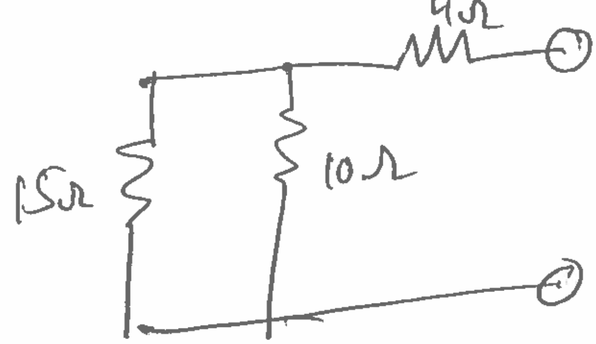
ex



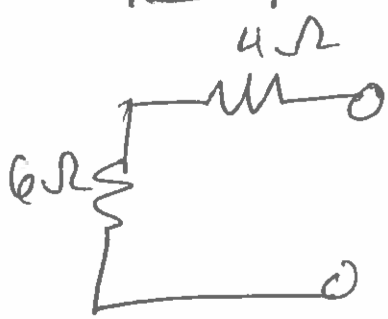
Find Norton - EQui V

DeActivate Power

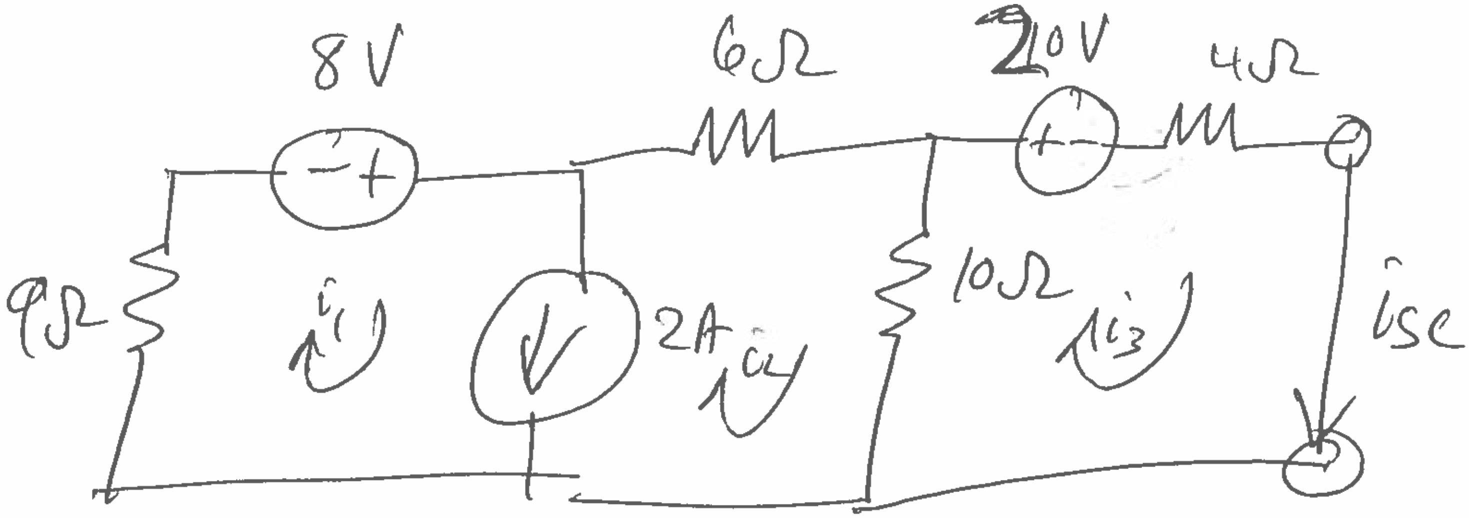




$$\frac{1}{15\Omega} + \frac{1}{10\Omega} = \frac{2+3}{30\Omega} = \frac{1}{6\Omega}$$



$R_t = 10\Omega$



$$i_{sc} = i_3$$

Supermesh

$$i_1 - i_2 = 2A$$

$$8V = i_1(9\Omega) + i_2(6\Omega + 10\Omega) - i_3(10\Omega)$$

$$-20V = i_3(10\Omega + 4\Omega) - i_2(10\Omega)$$

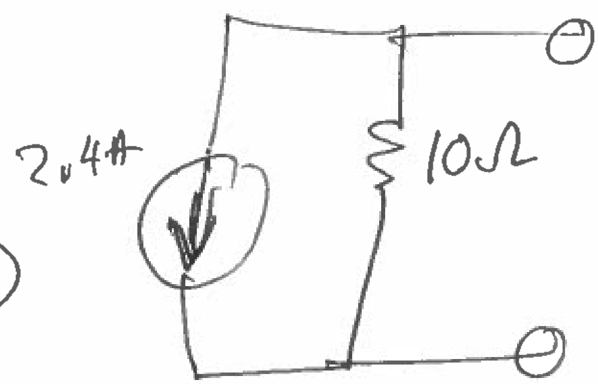
MATLAB

$$i_1 = 0.64\ A$$

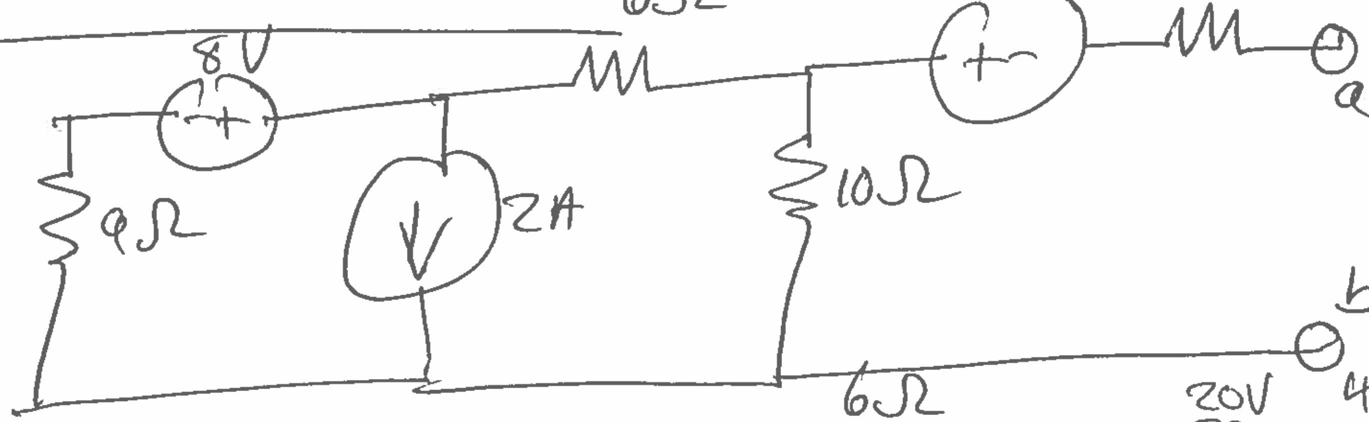
$$i_2 = -1.36\ A$$

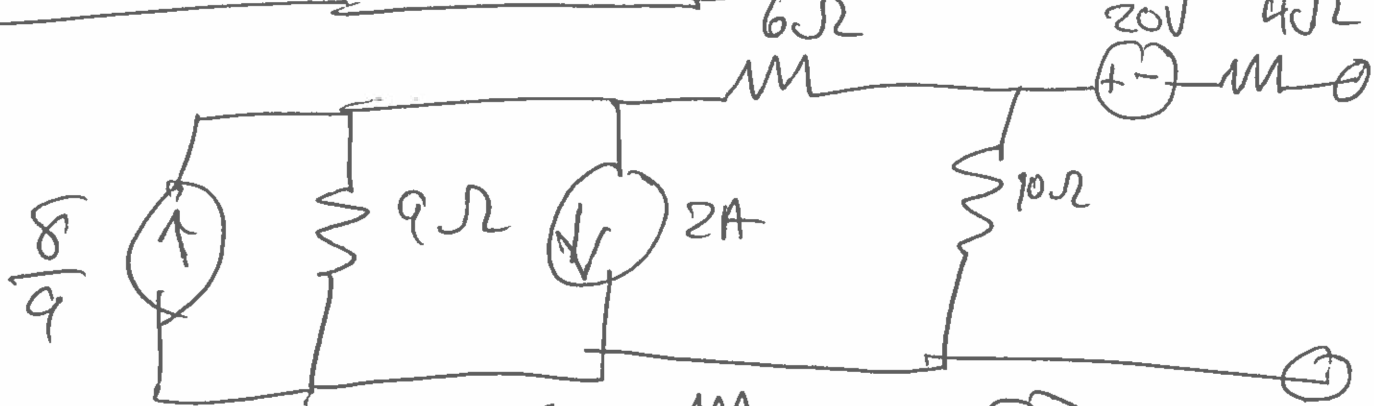
$$i_3 = -2.4\ A$$

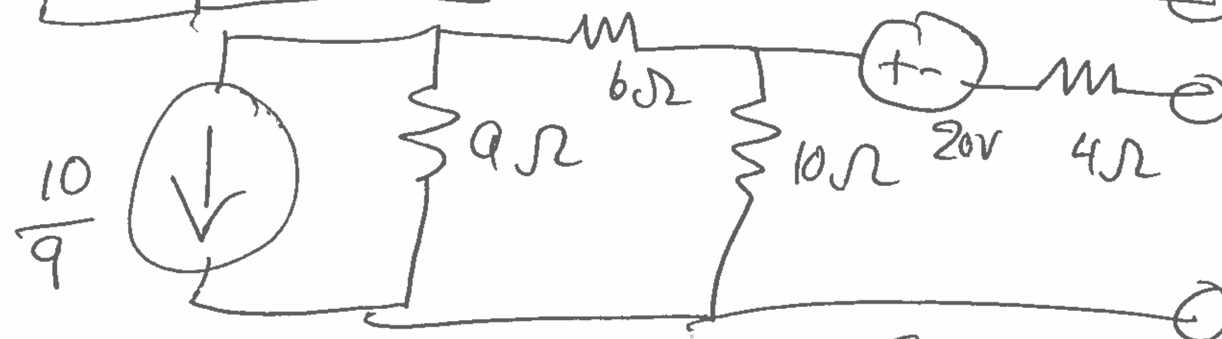
$\Rightarrow$

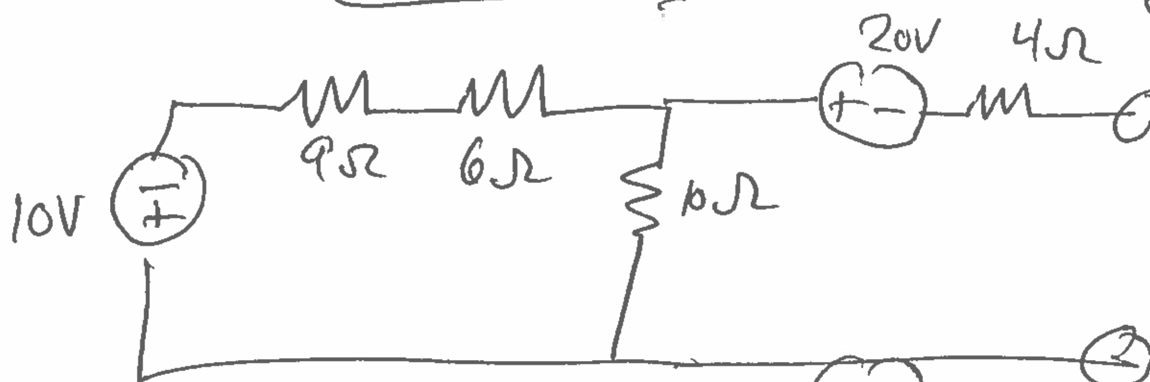


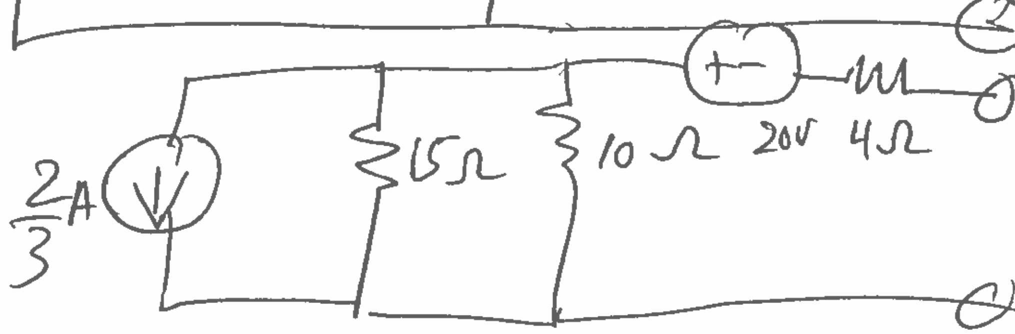
Source Transformations

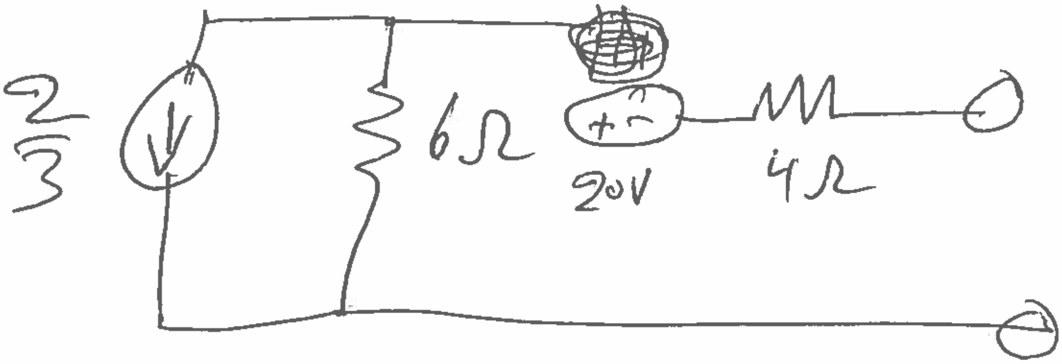


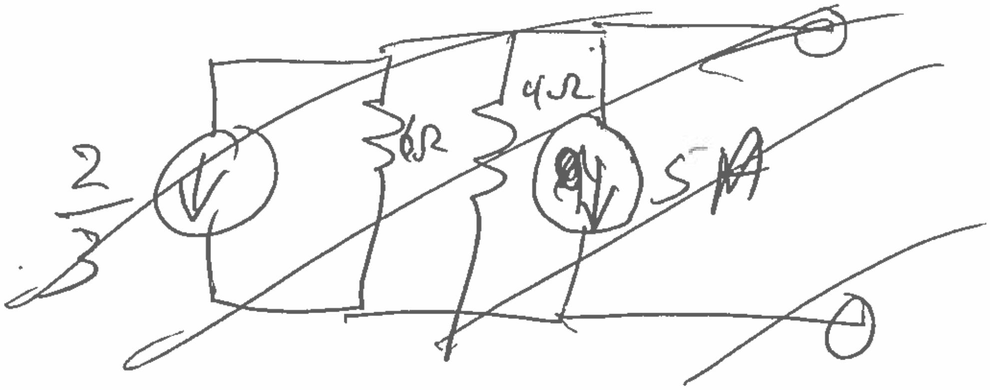


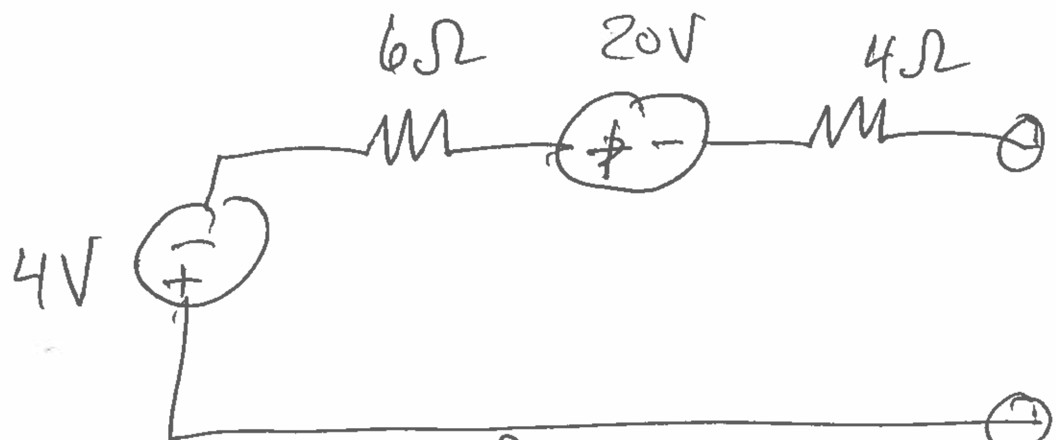


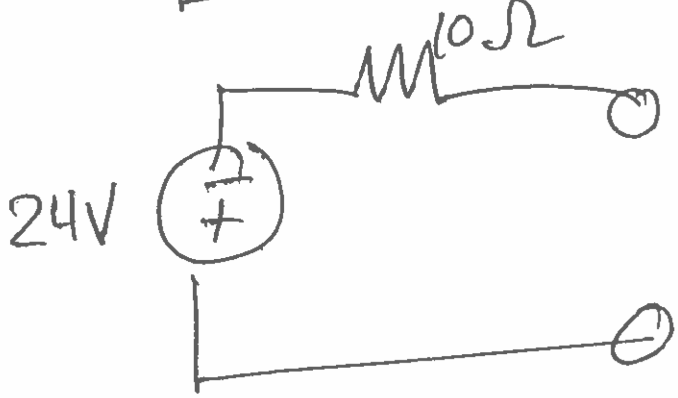




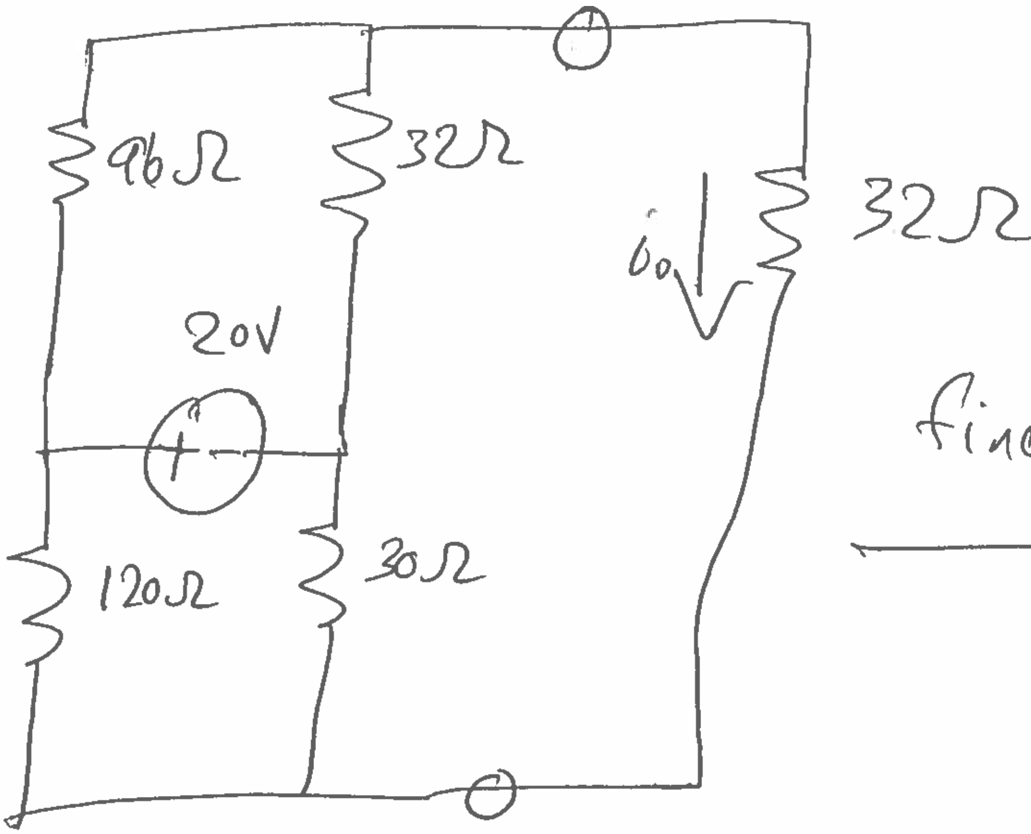




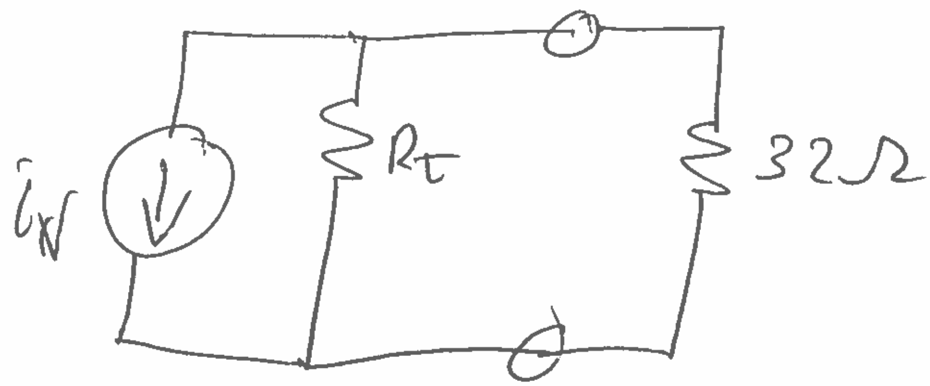




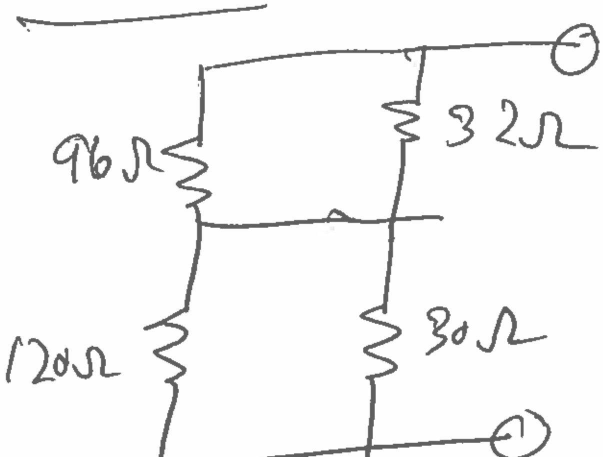
As before!



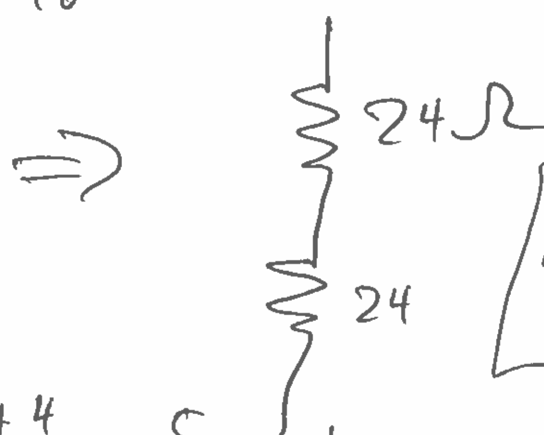
find i_o



Deactivate

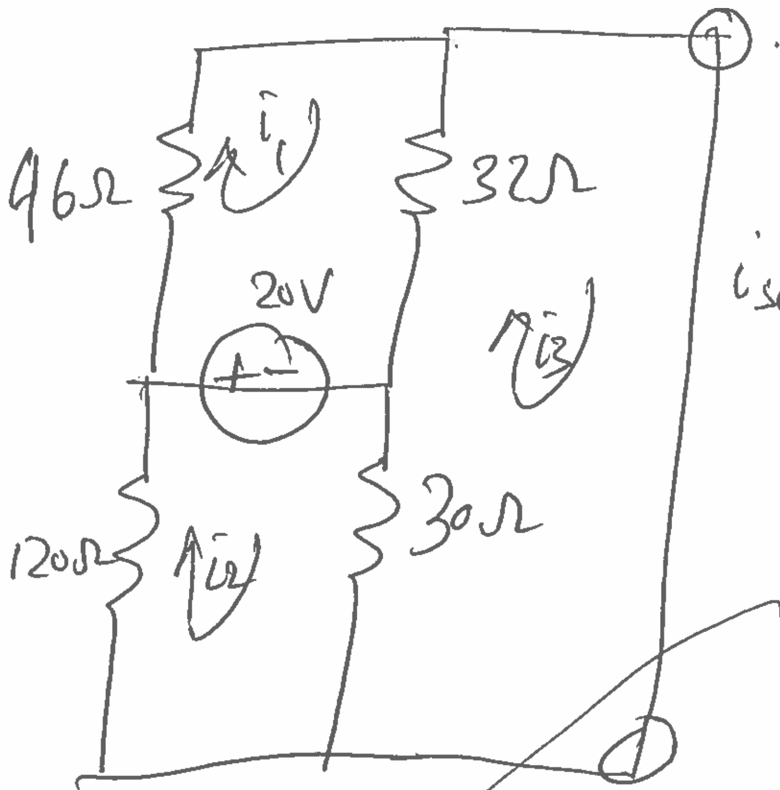


$$\frac{1+3}{96} = \frac{4}{96} = \frac{1}{24}$$



$$R_T = 48\Omega$$

$$\frac{1+4}{120} = \frac{5}{120} = \frac{1}{24}$$



i_{sc} $i_N = i_3$

$$20V = i_1 (96\Omega + 32\Omega) - i_3 (32\Omega)$$

$$-20V = i_2 (120\Omega + 30\Omega) - i_3 (30\Omega)$$

$$0 = i_3 (32\Omega + 30\Omega) - i_1 (32\Omega) - i_2 (30\Omega)$$

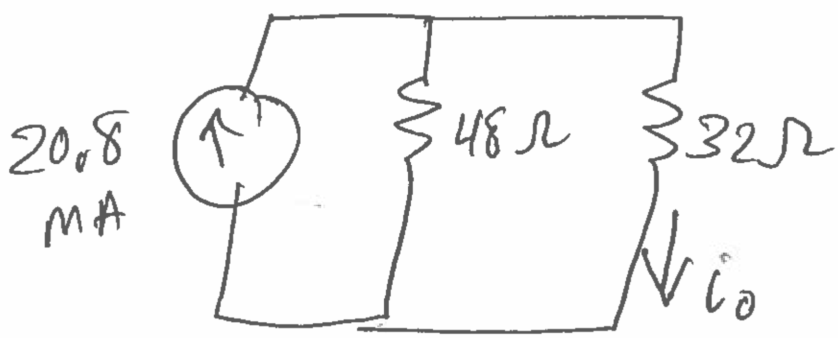
$$i_1 = \frac{20V + i_3 (32\Omega)}{128\Omega}$$

$$i_2 = \frac{-20V + i_3 (30\Omega)}{150\Omega}$$

$$0 = i_3(62\Omega) - (32\Omega)\left(\frac{20V + i_3(32\Omega)}{128\Omega}\right)$$

$$- (30\Omega)\left(\frac{20V + i_3(30\Omega)}{150\Omega}\right)$$

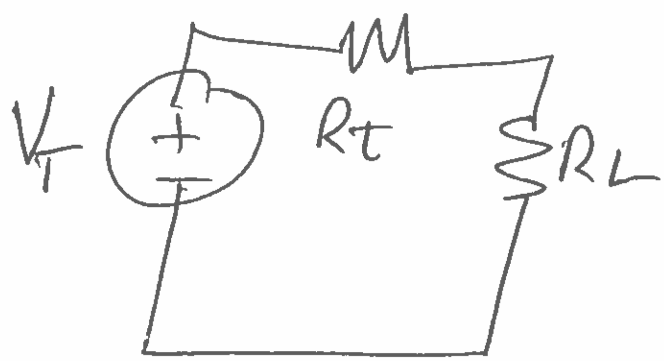
$$i_3 = 20.83\ mA$$



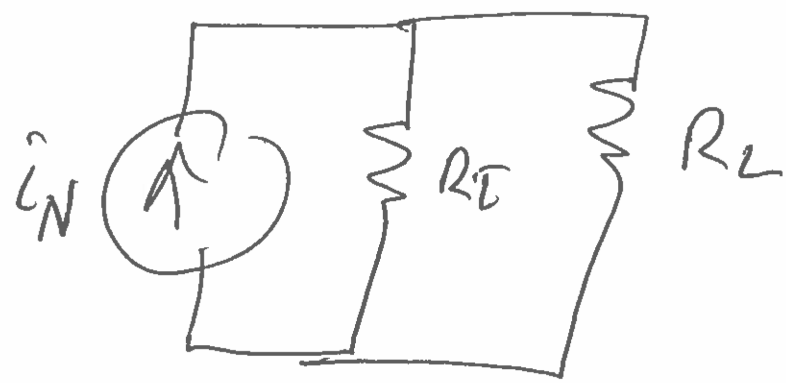
$$i_0 = \frac{(20.8\ mA)\frac{1}{32\Omega}}{\frac{1}{32\Omega} + \frac{1}{48\Omega}} \Rightarrow \underline{12.5\ mA}$$

Any Complex Circuit

Can be reduced to Either



or



What value of R_L will draw maximum Power from Complex circuit?

$$P_L = i_L^2 R_L$$

$$i_L = \frac{v_t}{R_t + R_L}$$

$$P_L = \left(\frac{v_t}{R_t + R_L}\right)^2 R_L$$

$$P_L = \frac{v_t^2}{(R_t + R_L)^2} R_L$$

what R_L is max?

$$\frac{\partial P_L}{\partial R_L} = \frac{v_t^2}{(R_t + R_L)^2} - \frac{2 v_t^2 R_L}{(R_t + R_L)^3} = 0$$

$$\frac{v_t^2}{(R_t + R_L)^2}\left[1 - \frac{2R_L}{R_t + R_L}\right] = 0$$

$$1 - \frac{2R_L}{R_T + R_L} = 0$$

$$R_T + R_L - 2R_L = 0$$

$$R_T - R_L = 0$$

$$\boxed{R_L = R_T}$$

When Load resisitance = Thevenin / Norton Resistance

maximum power is delivered to Load.