Note Title 9/16/2007

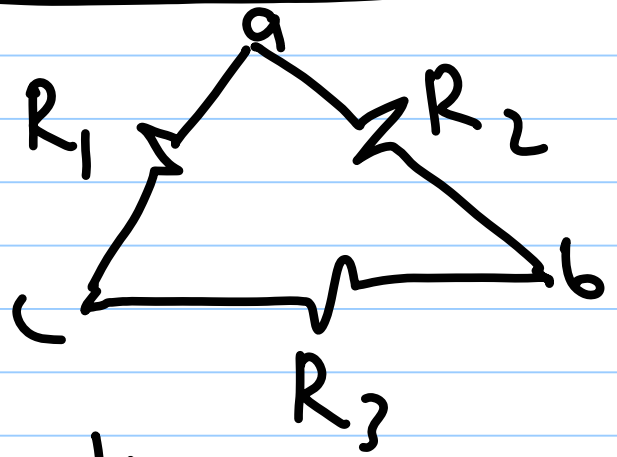
Lecture 5

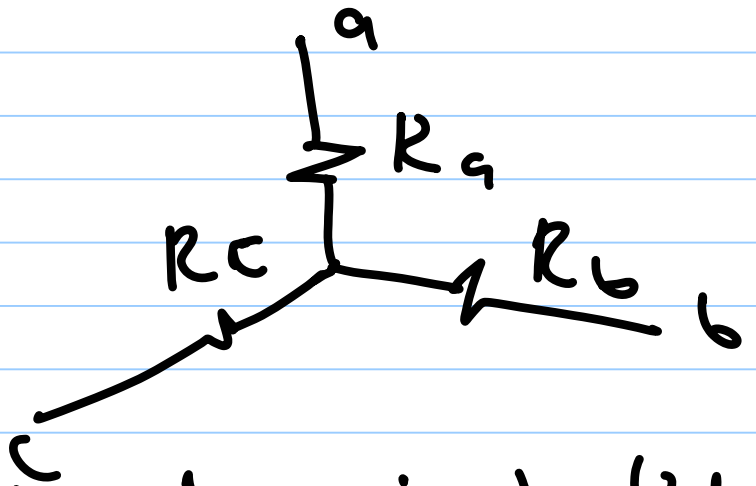
From Sections 2.7 and 2.8 of Textbook. Solve E2.17 - E2.18, 2.102, 2.107, 2.108

Wye $\Leftrightarrow$ Delta Transformation

* In some circuits, resistors are not connected in series nor in parallel
* In this case, the Δ-Y transformation is useful

Δ⇆Y Transformation (cont'd)





* These two connections are identical if you see the same resistance between any two terminals (the third is open)

$$R_a + R_b = R_2 // (R_1 + R_3)$$

$$R_a + R_c = R_1 // (R_2 + R_3)$$

$$R_b + R_c = R_3 // (R_1 + R_2)$$

Δ⇄Y Transformation (cont'd)

*Solving for R_a, R_b, and R_c we get

$$R_a = \frac{R_1 R_2}{R_1 + R_2 + R_3}$$

$$R_b = \frac{R_2 R_3}{R_1 + R_2 + R_3}$$

$$R_c = \frac{R_1 R_3}{R_1 + R_2 + R_3}$$

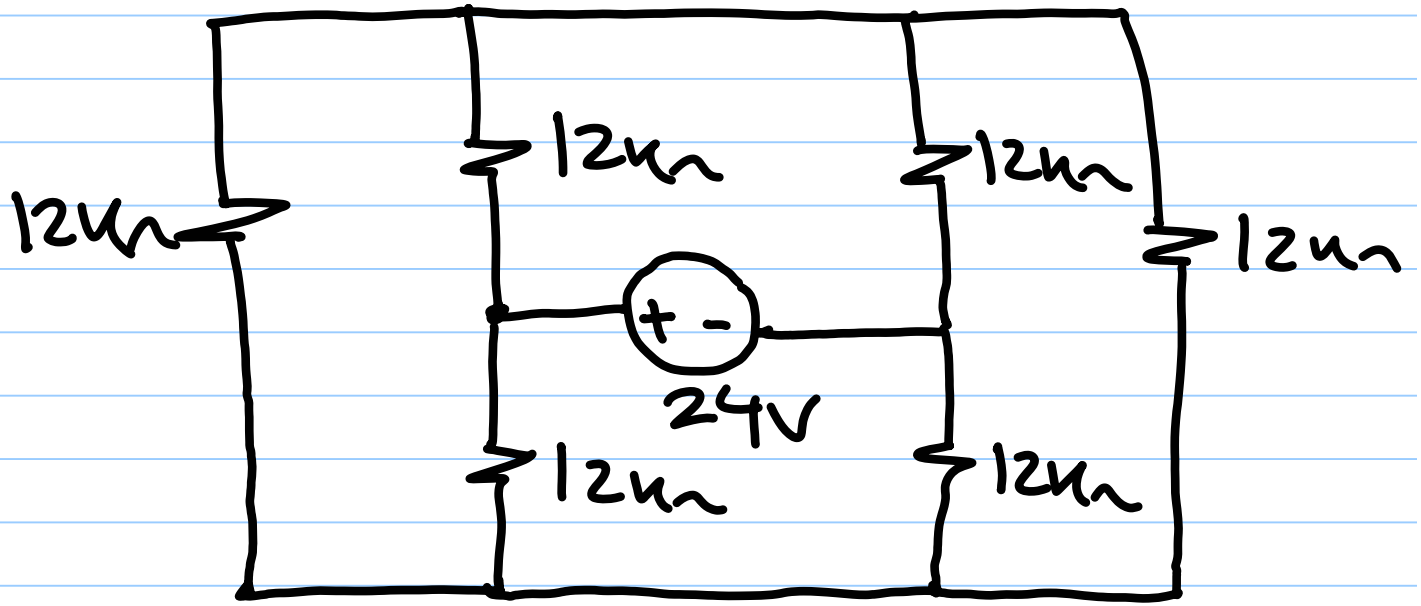
Solving for R_1, R_2, and R_3, we get

$$R_1 = \frac{R_a R_b + R_b R_c + R_a R_c}{R_b}$$

$$R_2 = \frac{R_a R_b + R_b R_c + R_a R_c}{R_c}$$

$$R_3 = \frac{R_a R_b + R_b R_c + R_a R_c}{R_a}$$

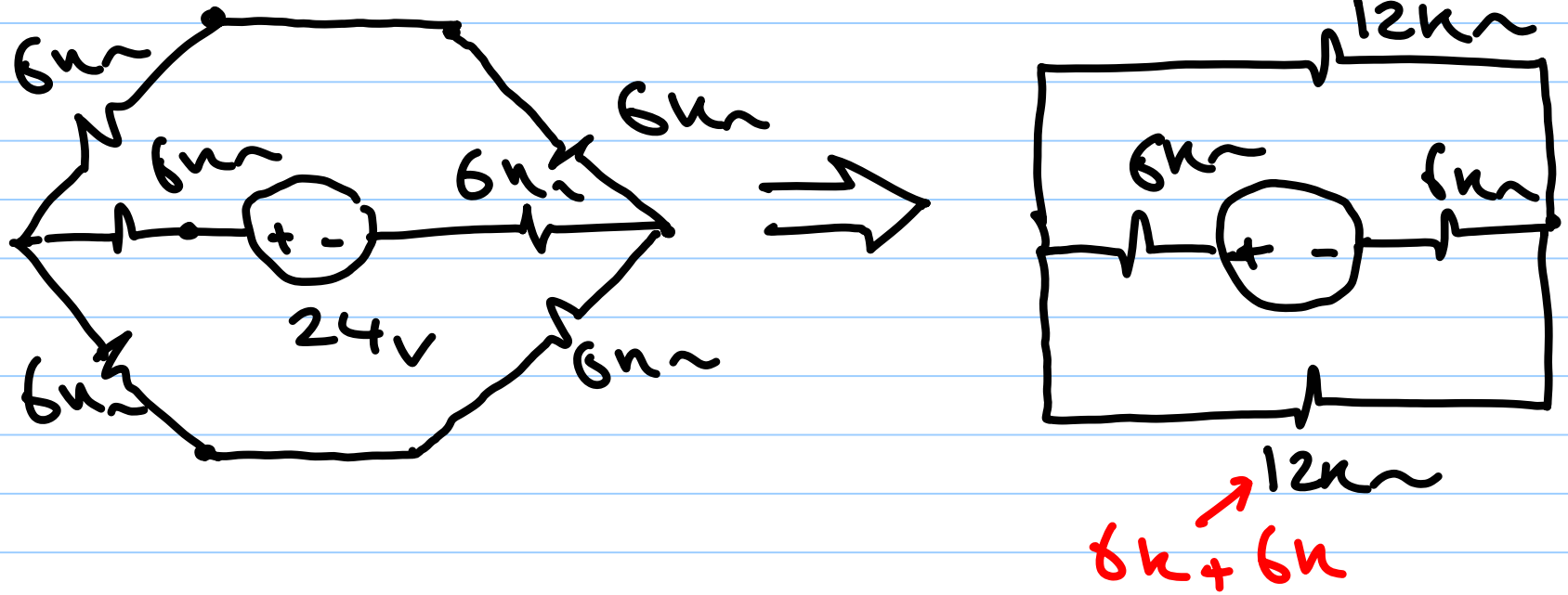
Example



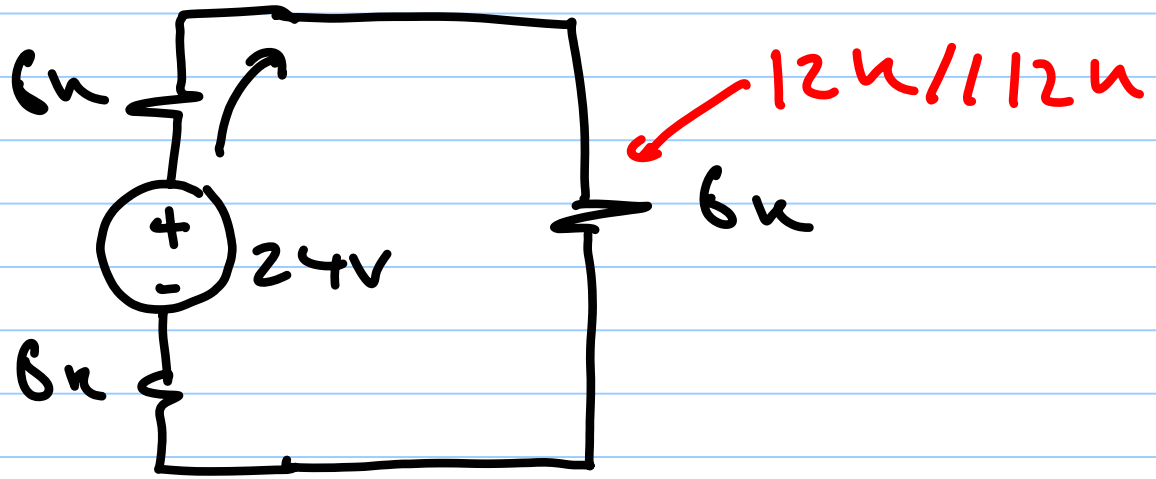
Find the power supplied by the 24V source in the shown circuit

Example (Cont'd)

* Using the $\Delta \rightarrow Y$ transformation for the 2 Δ connections, we get



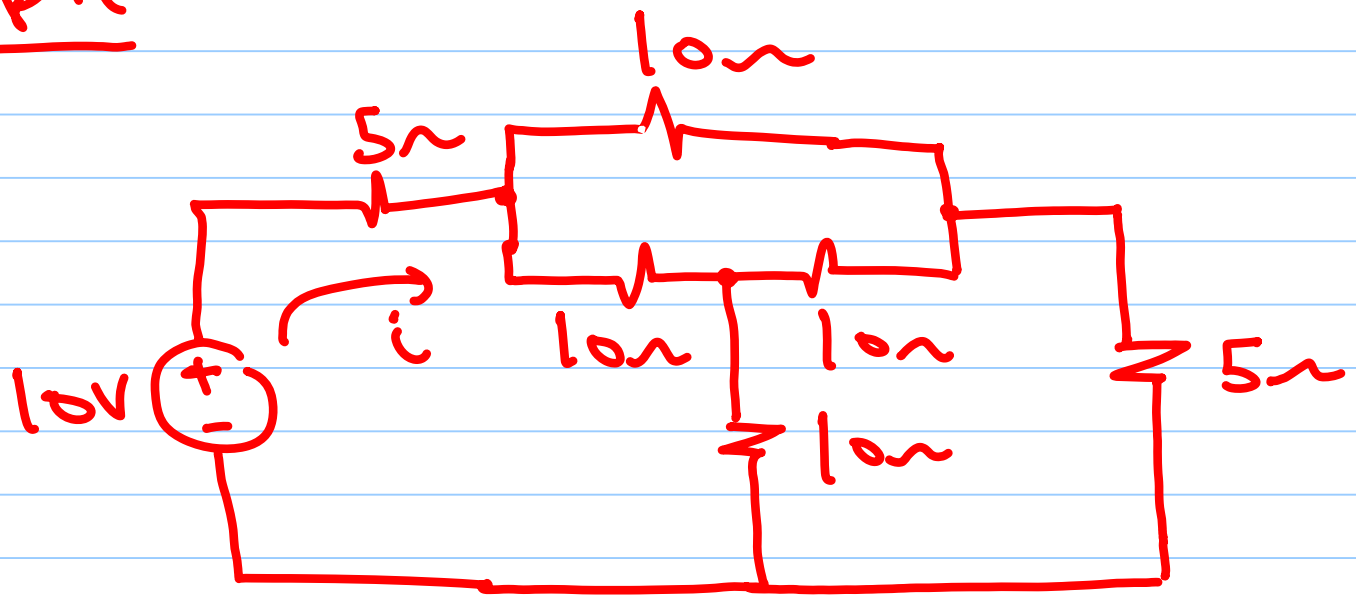
Example (cont'd)



$$i = \frac{24}{18k} = 1.333\ mA$$

$$p = Vi = 24 * 1.333 = 32\ mW$$

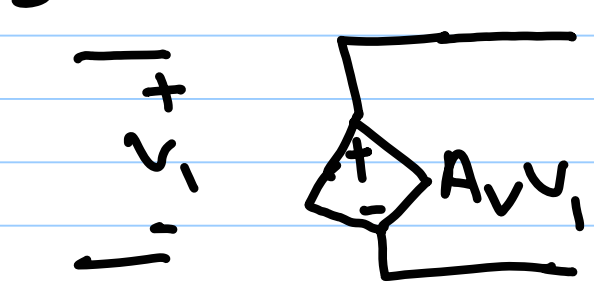
Example



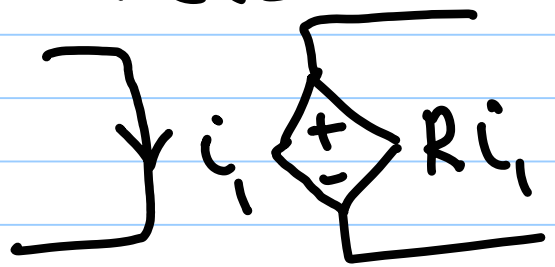
In the shown circuit, find the value of the current i

Dependant Sources

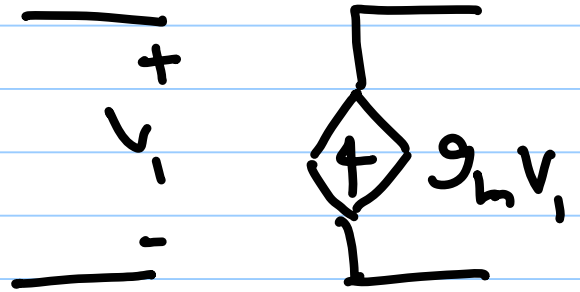
* There are 4 types of dependant Sources



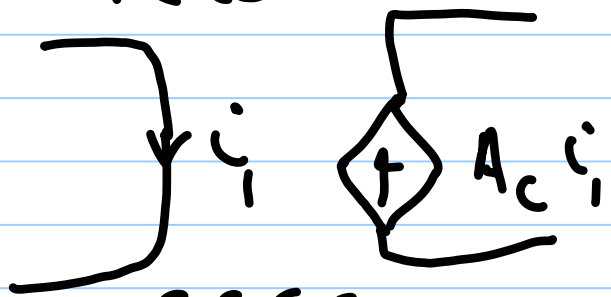
VCVS



CCVS

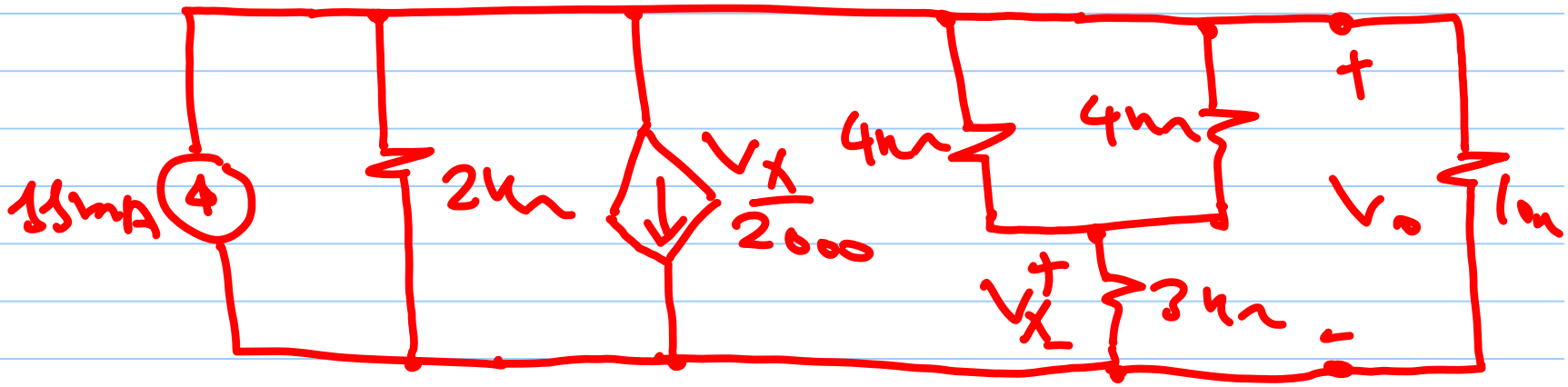


VCCS



CCCS

Example



Find the power absorbed by the 1Ω resistor in the shown circuit