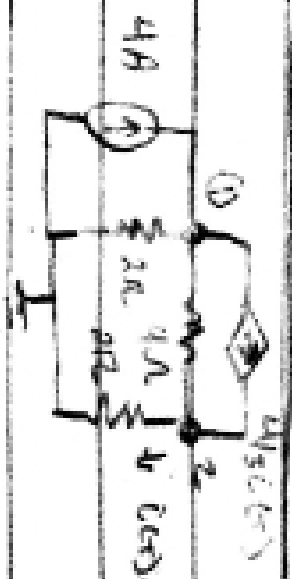


12-2-2014



Find $i(t)$

Node 1: $-4 + 4i(t) + \frac{v(t)}{2} + \frac{v(t) - v_2(t)}{4} = 0$
 Node 2: $-4/3 i(t) + \frac{v(t) - v_1(t)}{4} + \frac{v_2(t)}{2} = 0$

Ohm's Law = $i(t) = \frac{v_2(t)}{2}$

$12(-4 + 4/3 v_2(t) + \frac{v(t)}{2} + \frac{v_1(t) - v_2(t)}{4} = 0)$
 $12(-4 + 2/3 v_2(t) + \frac{v(t)}{2} - \frac{v_2(t)}{4}) = 0$

① $9v_1(t) + 5i_2(t) = 48$

$9v_1(t) + 5(-3v_1(t)) = 48$

$-6v_1(t) = 48$

$v_1(t) = -8V$

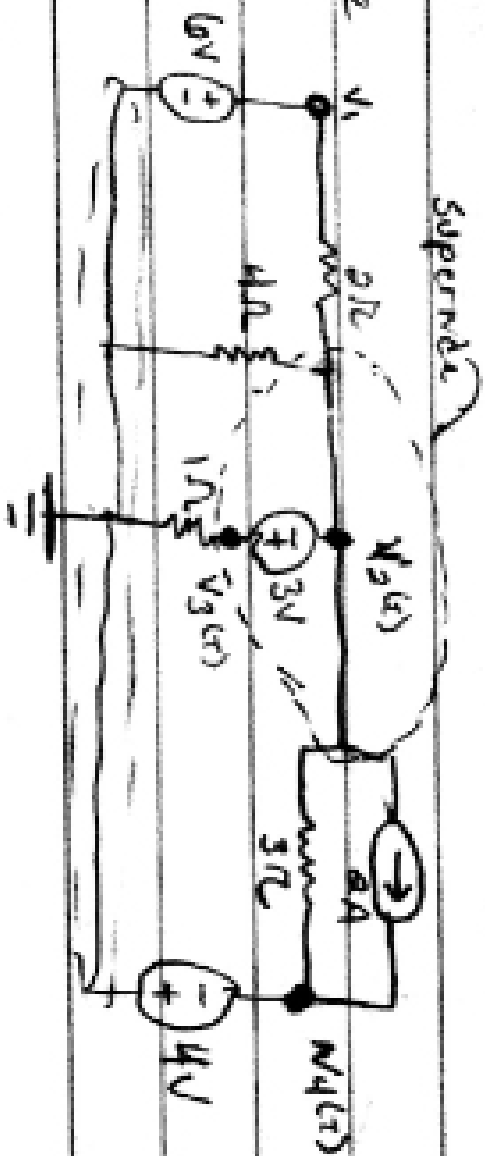
② $-3v_1(t) + v_2(t) = 0$

$v_2(t) = -3v_1(t)$

$v_2(t) = -3(-8V) = 24V$

$i(t) = 12A$

Example



$v_1 = 6V$ $v_4 = -4V$

① $\frac{v_2(t) - v_1(t)}{2} + \frac{v_2(t)}{4} + 2A + \frac{v_2(t) - v_4(t)}{3} + \frac{v_3(t)}{1} = 0$

Times by 12: $6v_2(t) = 4v_1(t) + 3$

$13v_2(t) + 12v_4(t) = -4$

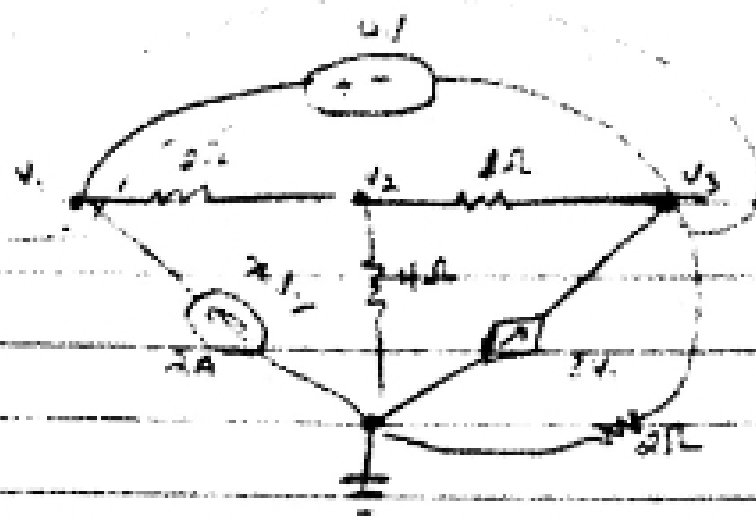
$13v_2(t) + 12[-4V] + 3 = -4$

$13v_2(t) = 24$

$v_2(t) = \frac{24}{13} V = -8/5$

$i(t) = \frac{v_2}{4} = i(t) = \frac{v_2}{4\Omega}$ $i(t) = -2/5 A$

super node



Find Power in 4Ω Resistor

$$\bullet SN: -2A \cdot \frac{v_2 - v_1}{2} + \frac{v_2 - v_3}{4} = 3v_1(t) + \frac{v_2(t)}{2} = 0$$

$$\textcircled{2}: \frac{v_2 - v_1}{2} = \frac{v_2 - v_3}{4} + \frac{v_2}{4}$$

$$v_1 = v_3 + 4V$$

$$4 + 2v_1 - v_2 + 2v_3 - 2v_2 = 6v_1 + v_3 = 0$$

$$2v_2 - 2v_1 + v_2 + 4v_2 - 4v_3 = 0$$

$$-5v_1 - 3v_2 - 3v_3 = 4$$

$$-2v_1 + 7v_2 - 4v_3 = 0$$

$$-20v_1 - 20 - 3v_2 - 3v_3 = 24$$

$$-2v_3 + 7v_2 + 8 - 4v_1(t) = 0$$

$$-3v_2 - 2v_3 = -24$$

$$7v_2(t) - 6v_1 = 6$$

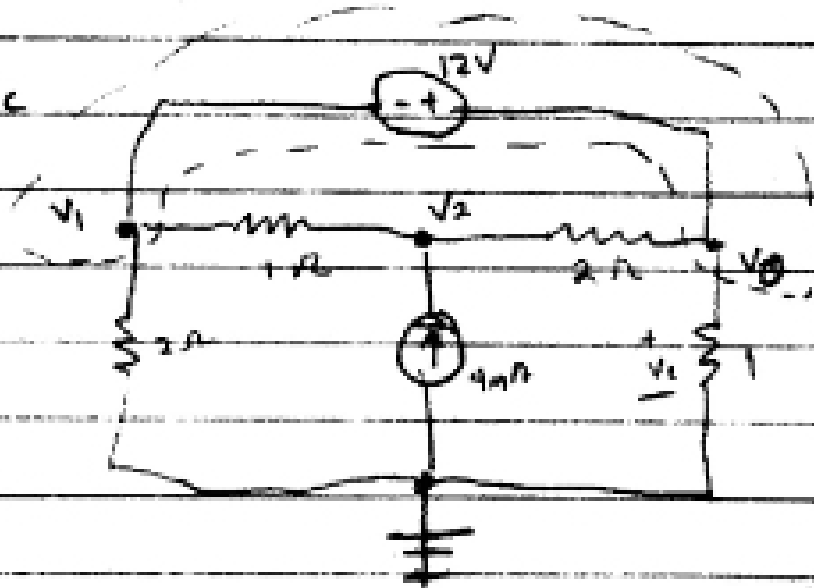
$$9v_2(t) + 6v_3 = -12$$

$$16v_2(t) = -4$$

$$v_2 = -0.25V$$

$$P_{4\Omega} = \frac{(-0.25)^2}{4} = \boxed{\frac{1}{64} W}$$

Example



$$SN: \frac{v_1}{2} + \frac{v_1(t) - v_2}{1} + \frac{v_2 - v_3}{2} + \frac{v_3}{1} = 0$$

$$\textcircled{2}: \frac{v_2 - v_1}{1} = 4mA + \frac{v_3(t) - v_2}{2}$$

$$v_1(t) = v_2 - 12$$

$$v_1 + 2v_1 - 2v_2 + v_3 - v_2 + 2v_3 = 0$$

$$2v_2 - 2v_1 - 8mA + v_3(t) - v_2 = 0$$

$$3v_2 - 36 - 3v_2 + 3v_3 = 36$$

$$= 2v_2 + 24 + 3v_2 - v_3 = 9$$

$$3v_1 - 3v_2 + 3v_3 = 0$$

$$= 2v_1 + 3v_3(t) - v_2 = 8mA$$

$$-3v_2 + 6v_3 = 36$$

$$3v_2 - 3v_3 = -16$$

$$3v_3 = 20$$

$$v_3 = \frac{20}{3} V_1$$

HW 3.12,