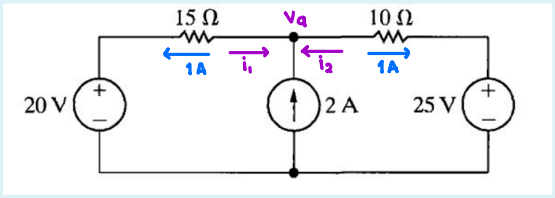
1.



AP4.13_9ed

Find the power absorbed/delivered by the 2 A current source in this circuit.

P_{2A} = -70 ✔ W

"+" = absorbed and "-" = delivered

$i_1 + i_2 + 2A = 0$

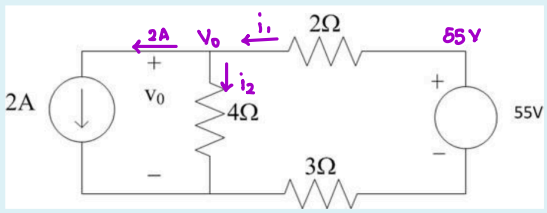
$\left[\frac{20 - v_a}{15} + \frac{25 - v_a}{10} + 2 = 0\right] 30$

$40 - 2v_a + 75 - 3v_a + 60 = 0$

$v_a = 35\ V$

$P = iv = (2)(35) = 70\ W\ (-)$

2.



P4.02_6ed

Use the node-voltage method.

a) Find the voltage v_0 across the 2A current source in this circuit.

v_0 = 20 ✔ V

b) Find the power absorbed/delivered by the 2A current source.

P_{2A} = 40 ✔ W

$i_1 - i_2 - 2A = 0$

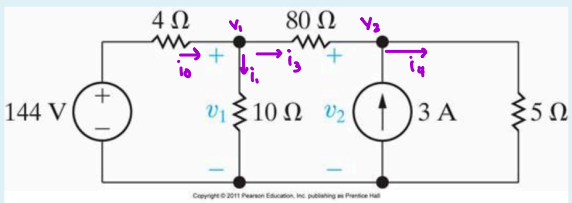
$\left[\frac{55 - v_o}{2+3} - \frac{v_o}{4} = 2\right] 20$

$220 - 4v_o - 5v_o = 40$

$v_o = 20V$

$P = iV = (2)(20) = 40\ W$

3.



P4.06_9ed

Use the node-voltage method to find v1 and v2 in this circuit.

v_1 = 100 ✔ V

v_2 = 20 ✔ V

$i_0 - i_1 - i_3 = 0$

$\left[\frac{144 - v_1}{4} - \frac{v_1}{10} - \frac{v_1 - v_2}{80} = 0\right] 80$

$2880 - 20v_1 - 8v_1 - v_1 + v_2 = 0$

$-29v_1 + v_2 = -2880$

$i_3 - i_4 + 3 = 0$

$\left[\frac{v_1 - v_2}{80} - \frac{v_2}{5} + 3 = 0\right] 80$

$v_1 - v_2 - 16v_2 = -240$

$v_1 - 17v_2 = -240$

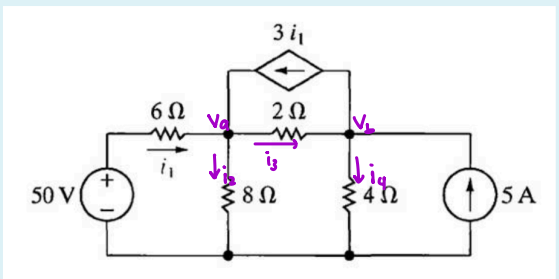
$17\ [-29v_1 + v_2 = -2880]$

$-492 = -49200$

$v_1 = 100\ V$

$v_2 = 20V$

4.



AP4.03b_9ed

Use the node-voltage method to find the power absorbed/delivered by each source in this circuit.

P_{50V} = -150 ✔ W

P_{5A} = -80 ✔ W

$P_{3\,i1}$ = -144 ✔ W (power associated with the dependent current source)

"+" = absorbed and "-" = delivered

$i_1 + 3i_1 - i_2 - i_3 = 0$

$4i_1 - i_2 - i_3 = 0$

$\left[4\left(\frac{50 - v_a}{6}\right) - \frac{v_a}{8} - \frac{v_a - v_b}{2} = 0\right] 24$

$4(200 - 4v_a) - 3v_a - 12v_a + 12v_b = 0$

$-31v_a + 12v_b = -800$

$-3i_1 + i_3 - i_4 + 5 = 0$

$\left[-\frac{50 - v_a}{2} + \frac{v_a - v_b}{2} - \frac{v_b}{4} + 5 = 0\right] 4$

$-100 + 2v_a + 2v_a - 2v_b - v_b + 20 = 0$

$(4v_a - 3v_b = 80)\ 4$

$-31v_a + 12v_b = -800$

$-15v_a = -480$

$v_a = 32V$

$v_b = 16V$

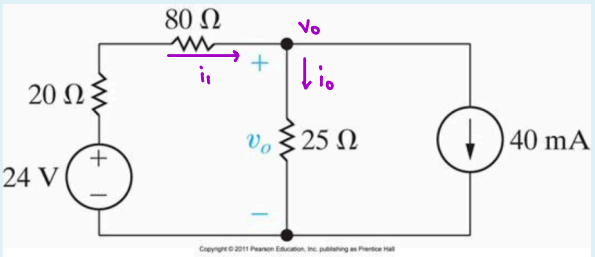
$i_1 = \frac{50 - 32}{6} = 3\ A$

$P_{50V} = (3)(50) = -150\ W$

$P_{5A} = (5)(v_b) = (5)(16) = -80\ W$

$P_{3i} = (3i)(v_a - v_b) = [3(3)](32 - 16) = -144\ W$

5.



P4.09_9ed

Use the node-voltage method to find v_0 in this circuit.

v_0 = 4 ✔ V

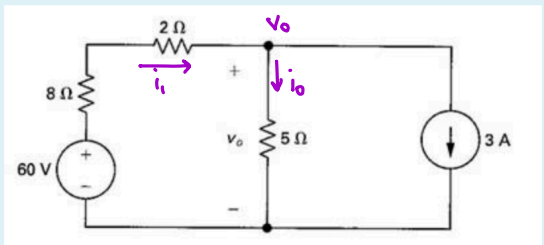
$i_1 - i_o - 0.04 = 0$

$\left[\frac{24 - V_o}{100} - \frac{V_o}{25} - 0.04 = 0\right] 100$

$24 - V_o - 4V_o - 4 = 0$

$V_o = 4\,V$

6.



P4.05_6ed

Use the node-voltage method.

a) Find v0 in this circuit.

v_0 = 10 ✔ V

b) Find the power absorbed/delivered by the 3A current source.

P_{3A} = 30 ✔ W

$i_1 - i_o - 3 = 0$

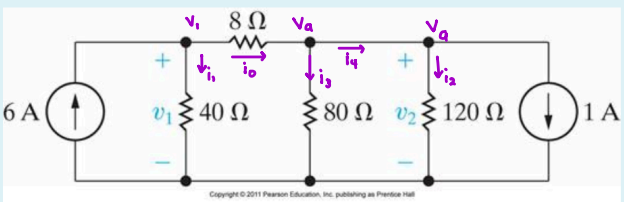
$\left[\frac{60 - V_o}{10} - \frac{V_o}{5} - 3 = 0\right] 10$

$60 - V_o - 2V_o - 30 = 0$

$V_o = 10\,V$

$P_{3A} = (3)(V_o) = (3)(10) = 30\,W$

7.



P4.08_9ed

Use the node-voltage method to find v_1 and v_2 in this circuit.

v_1 = 120 ✔ V

v_2 = 96 ✔ V

$6 - i_1 - i_o = 0$

$\left[6 - \frac{V_1}{40} - \frac{V_1 - V_a}{8} = 0\right] 40$

$240 - V_1 - 5V_1 + 5V_a = 0$

$-6V_1 + 5V_a = -240$

$i_o - i_3 - i_4 = 0$

$\left[\frac{V_1 - V_a}{8} - \frac{V_a}{80} - i_4 = 0\right] 80$

$10V_1 - 10V_a - V_a - 80i_4 = 0$

$10V_1 - 11V_a - 80\left[\frac{V_a}{120} + 1\right] = 0$

$i_4 - i_2 - 1 = 0$

$i_4 = \frac{V_a}{120} + 1$

$\left[10V_1 - 11V_a - \frac{2}{3}V_a - 80 = 0\right] 3$

$30V_1 - 33V_a - 2V_a - 240 = 0$

$30V_1 - 35V_a = 240$

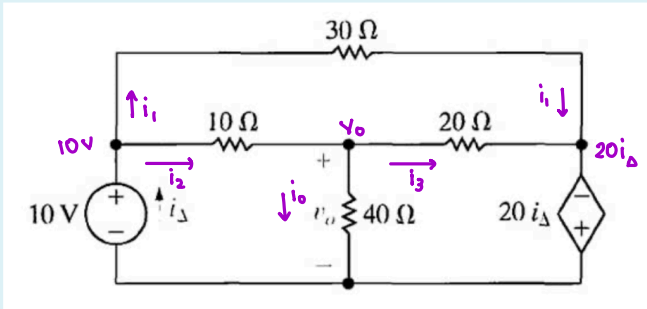
$(-6V_1 + 5V_a = -240)\,5$

$-10V_a = -960$

$V_a = 96\,V = V_2$

$V_1 = 120\,V$

8.



AP4.04_9ed

Use the node-voltage method to find v_O in the circuit shown

v_O = 24 ✔ V

NODE 10V: $i_\Delta = i_1 + i_2$

$\left[i_\Delta = \frac{10 - 20i_\Delta}{30} + \frac{10 - V_o}{10}\right] 30$

$30i_\Delta = 10 - 20i_\Delta + 30 - 3V_o$

$50i_\Delta + 3V_o = 40$

NODE V_o: $i_2 - i_o - i_3 = 0$

$\left[\frac{V_o - 10}{10} - \frac{V_o}{40} - \frac{V_o - 20i_\Delta}{20} = 0\right] 40$

$4V_o - 40 - V_o - 2V_o + 40i_\Delta = 0$

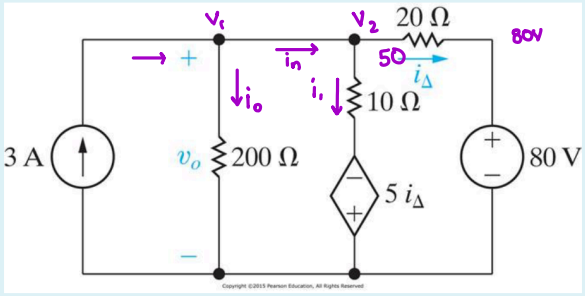
$40i_\Delta + V_o = 40$

$[50i_\Delta + 3V_o = 40]\,4$

$[40i_\Delta + V_o = 40]\,-5$

$7V_o = -40$

$V_o =$



P4.17_10ed

a) Use the node-voltage method to find v0 in the circuit shown

v_0 = 50 ✔ V

b) Find the power absorbed/delivered by the dependent source P_{ds}.

P_{ds} = 31.875 ✔ W

c) Find the power absorbed/delivered by the independent sources.

P_{3A} = -150 ✔ W

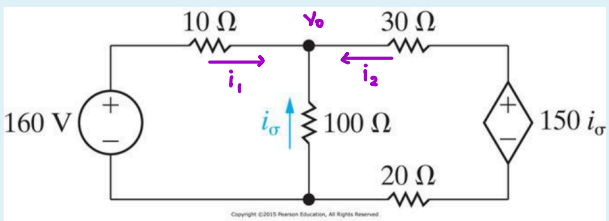
P_{80V} = -120 ✔ W

$i_1 = \frac{50-(-3.5)}{10}$ $i_\Delta = \frac{50-80}{20} = 1.5$

5.75 -7.5

$P = (-3.5)(5.75)$

10.



P4.18_10ed

Use the node-voltage method to find the power absorbed/delivered by the dependent source Pds.

P_{ds} = -750 ✔ W

Node V_o: $i_\sigma = i_1 + i_2$

$\left[i_\sigma + \frac{V_o - 160}{10} + \frac{V_o - 150 i_\sigma}{50} = 0 \right] 50$

$50 i_\sigma + 5V_o - 800 + V_o - 150 i_\sigma = 0$

$-100 i_\sigma + 6V_o = 800$

$-100\left(\frac{V_o}{100}\right) + 6V_o = 800$

$-V_o + 6V_o = 800$

$V_o =$

$V_o = 200V$

$i_\sigma = \frac{200}{100} = 2A$

$V = 150 i_\sigma = 300V$