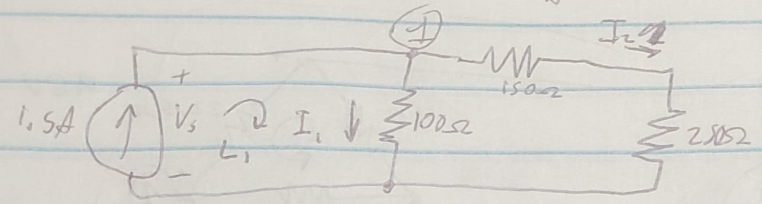
# HW #2

2.17




KCL at node ①: $1.5 = I_1 + I_2$, $I_1 = 1.5 - I_2$

$V_s = I_1(100\Omega) = I_2(150\Omega + 250\Omega) \rightarrow (1.5 - I_2)(100) = I_2(150 + 250)$

$150 - 100I_2 = 400I_2$

$150 = 500I_2 \rightarrow \boxed{I_2 = 0.\overline{27}\,A}$

a) $\boxed{I_1 = 1.5 - 0.\overline{27} = 1.2\overline{27}\,A}$

b) KVL in $L_1$: $V_s = V_{100\Omega}$ $\quad V_{100\Omega} = I_1 \cdot R_{100\Omega}$, $1.2\overline{27} \cdot 100$

$\boxed{V_s = 122.\overline{72}\,V}$

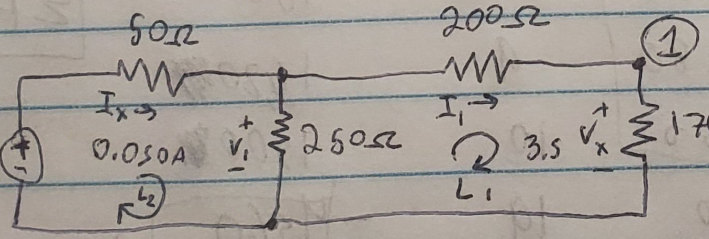
c)

| | V | I | P |
|---|---|---|---|
| $R_{100\Omega}$ | 122.72 | 1.227 | 150.62W |
| $R_{150\Omega}$ | $40.\overline{90}$ | $0.\overline{27}$ | 11.16W |
| $R_{250\Omega}$ | $68.\overline{18}$ | $0.\overline{27}$ | 18.60W |
| Current source | 122.72 | 1.5 | −184.09W |

$\boxed{\Sigma P = -3.62\,W}$

possible rounding error

2.21




KCL at Node ①: $I_1 = I_{175\Omega}$

$I_{175} = \frac{V}{R} = \frac{3.5}{175} = \boxed{0.02\,A}$ a)

KVL in $L_1$: $V_1 = V_{200\Omega} + V_x$, $V_{200\Omega} = 0.02 \cdot 200 = 4V$, $V_x = 3.5$, $V_1 = 4 + 3.5 = \boxed{7.5\,V}$ b)

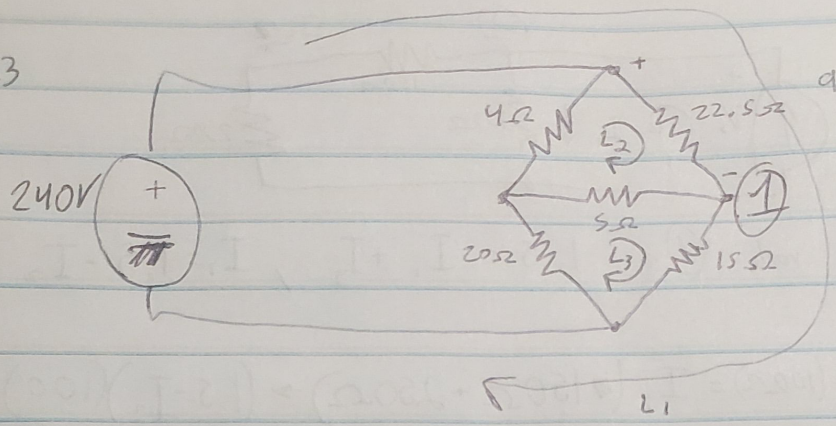
KVL in $L_2$: $V_g = V_{50\Omega} + V_1$, $V_{50\Omega} = 0.05 \cdot 50 = 2.5V$, $V_g = 2.5 + 7.5 = \boxed{10\,V}$ c)

| | V | I | P |
|---|---|---|---|
| $R_{50\Omega}$ | 2.5 | 0.05 | 0.125W |
| $R_{250\Omega}$ | 7.5 | 0.03 | 0.225W |
| $R_{200\Omega}$ | 4 | 0.02 | 0.08W |
| $R_{175\Omega}$ | 3.5 | 0.02 | 0.07W |
| $V_g$ | 10 | 0.05 | −0.5W |

$\Sigma P = 0W$

$\boxed{0.5W}$ d)

2.23




KVL in loop 1: ~~240~~ $240 = 90 + V_{15\Omega}$, $V_{15} = 150V$

KCL at node (1): $I_{5\Omega} + I_{22.5\Omega} = I_{15\Omega}$, $I_{22.5\Omega} = 4A$, $I_{15\Omega} = 10A$

$I_{5\Omega} + 4 = 10$, $I_{5\Omega} = 6A$, $V_{5\Omega} = 30V$

KVL in loop 2: $-V_{4\Omega} + V_{22.5\Omega} - V_{5\Omega} = 0$, $V_{22.5} = V_{4\Omega} + V_{5\Omega}$, $90 = V_{4\Omega} + 30$

$V_{4\Omega} = 60V$

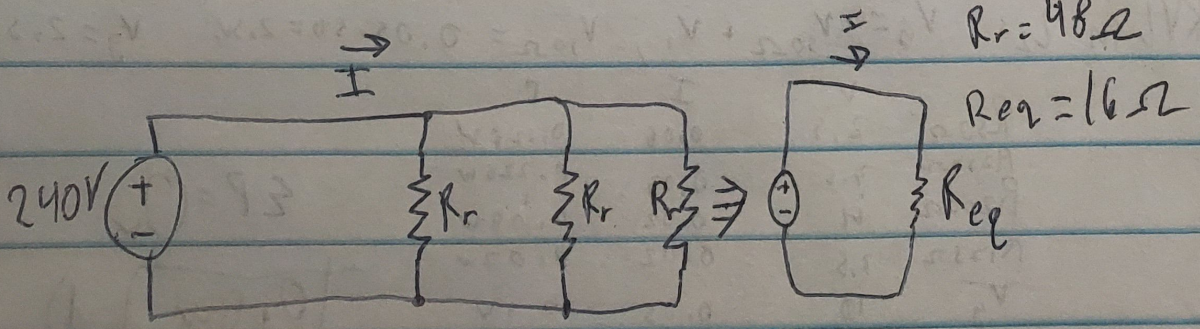
KVL in Loop 3: $-V_{20\Omega} + V_{5\Omega} + V_{15\Omega} = 0$, $V_{20\Omega} = V_{5\Omega} + V_{15\Omega}$

$V_{20\Omega} = 30 + 150 = 180$

| | a) voltage | current | power |
|---|---|---|---|
| 4Ω | 60 | 15 | 900 |
| 22.5Ω | 90 | 4 | 360 |
| 5Ω | 30 | 6 | 180 |
| 20Ω | 180 | 9 | 1620 |
| 15Ω | 150 | 10 | 1500 |
| source | 240 | 19 | −4560w b) |

$\Sigma P = 0$ c)

2.41

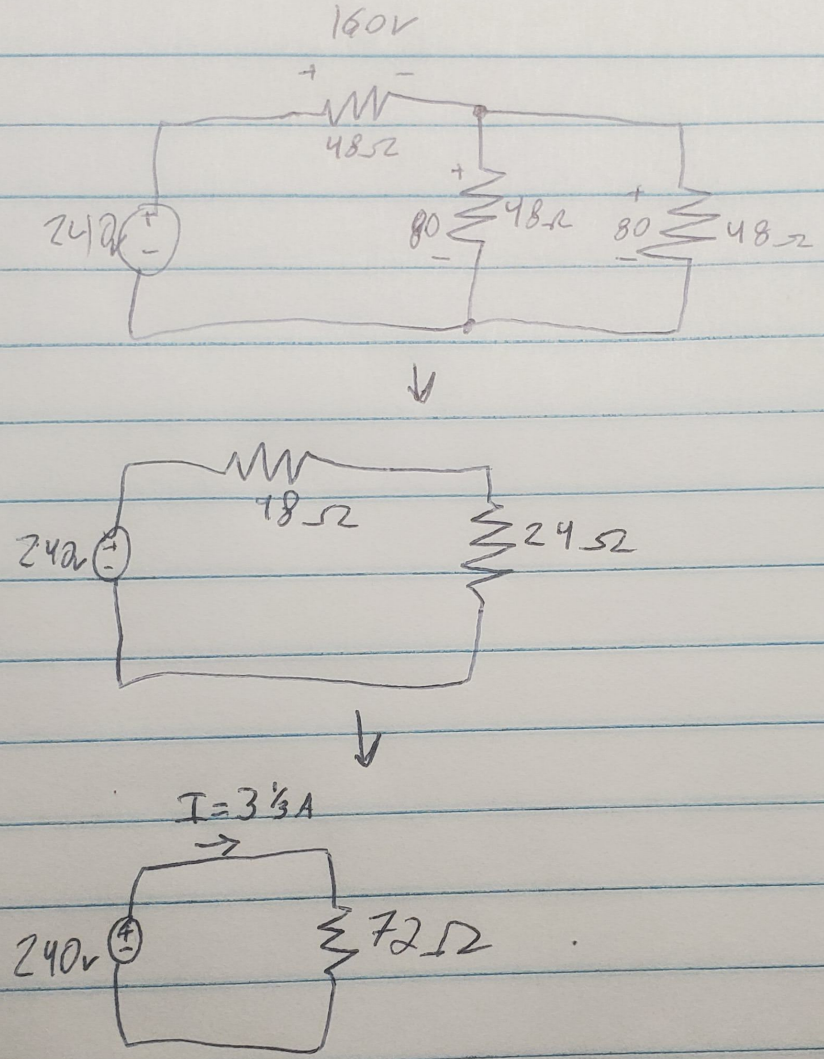



$R_r = 48\Omega$ $I = 15A$

$R_{eq} = 16\Omega$

Each radiator puts out 1200 watts of power

2.43




The radiator in series with the voltage source puts out 533.8W while the two in parallel each put out 133.$\overline{3}$W