2

2.58

✓ Answer

$$\begin{bmatrix} 6 & -3 & -3 \\ -3 & 15 & -6 \\ -3 & -6 & 15 \end{bmatrix} I = \begin{bmatrix} 4 \\ 0 \\ 0 \end{bmatrix}$$

$$I = \begin{bmatrix} 1 \\ \frac{1}{3} \\ \frac{1}{3} \end{bmatrix}$$

With I_1 as the top loop, I_2 as the bottom left loop, and I_3 as the bottom right loop, all clockwise.

$$P = VI$$
$$= -4W$$

3.7

✓ Answer

$$\begin{bmatrix} 15 & -10 & 0 \\ -10 & 25 & -10 \\ 0 & -10 & 15 \end{bmatrix} I = \begin{bmatrix} 21 \\ 0 \\ 10.5 \end{bmatrix}$$

$$I = \begin{bmatrix} 2.6 \\ 1.8 \\ 1.9 \end{bmatrix}$$

With $I_{1,2,3}$ as the left, middle, and right loops, all clockwise.

This makes $I_x = I_2 - I_3 = -0.1A$

3.12

✓ Answer

After transforming the circuit to remove the constant current source.

$$\begin{bmatrix} 14 & -10 & -4 \\ -10 & 35 & -20 \\ -4 & -20 & 26 \end{bmatrix} I = \begin{bmatrix} 12.3 \\ 0 \\ -4I_x \end{bmatrix}$$

$$I = \begin{bmatrix} 2.63571428571429 - 4I_x/7 \\ 1.75714285714286 - 64I_x/119 \\ 1.75714285714286 - 78I_x/119 \end{bmatrix}$$

$0.878571428571429 - 4I_x/119 = I_x$
$I_x = 0.85A$

3.15

✓ **Answer**

With a supernode of the voltage source,

$2V_1 + 2V_x = 4$
$V_1 + 6 = V_x$

$4V_x = 16$
$V_x = 4$
$I_x = 2V_x = 8A$

3.17

✓ **Answer**

$$\begin{bmatrix} 4 & -2 & -1 \\ -2 & 12 & -6 \\ -1 & -6 & 8 \end{bmatrix} I = \begin{bmatrix} 8 \\ -2a \\ 2a \end{bmatrix}$$
$$I = \begin{bmatrix} a/43 + 120/43 \\ 44/43 - 5a/86 \\ 9a/43 + 48/43 \end{bmatrix}$$

$72/43 - 8a/43 = a$
$a = \frac{24}{17}$
$$I = \begin{bmatrix} 2.82352941176471 \\ 0.941176470588235 \\ 1.41176470588235 \end{bmatrix}$$

$V_x = 1.41176470588235V$