1. Combining the four parallel resistor combinations on the right, the circuit reduces to:

\[ i_1 = \frac{80}{10} = 8 \Rightarrow i_2 = \frac{10}{20}i_1 = 4 \]

\[ i = \frac{12}{16}i_2 = 3A \]

\[ v = (2 \parallel 2)i_2 = 4V \]

2. Due to the short circuit in the top branch, the series 8+4, the series 1+3 and the 6Ω resistors are all shorted out and can be replaced by a short as shown below. Additionally, the 12\parallel4\parallel6 = 2Ω, thus the circuit reduces to:

\[ \Rightarrow R_{eq} = 3 + 6 + 2 = 11Ω \]

3. Using the nodes as labeled in the diagram:

\[ V_1 = 10 \]

\[ V_3 = 2i_a \]

\[ 3v_a = \frac{V_2 - V_1}{4} + \frac{V_2 - V_3}{5} \]

\[ i_a = \frac{V_1 - V_2}{4} \]

\[ v_a = V_3 - V_2 \]
4. Using the mesh currents as labeled in the diagram:
   \( i_1 = 2 \)
   \( 3v_a = i_3 - i_2 \)
   \(-10 + 4(i_2 - i_1) + 5(i_3 - i_2) + 2i_a = 0 \)
   \( i_a = i_2 - i_1 \)
   \( v_a = 5(i_1 - i_3) \)

5. If we label the node on the output of the left op amp to be \( v_1 \) and the node on the output of the right op amp to be \( v_2 \), writing KCL at the positive input of both op amps:
   \[
   \frac{0 - 5}{2K} + \frac{0 - v_1}{8K} = 0 \Rightarrow v_1 = -20
   \]
   \[
   \frac{0 - 6}{3K} + \frac{0 - v_2}{6K} = 0 \Rightarrow v_2 = -12
   \]
   \( i_o = \frac{v_1 - v_2}{4K} = -2mA \)

6. To find \( V_{oc} \) and \( I_{sc} \):
   \[
   V_{oc} = -4i + 6i = 2i
   \]
   \( i = 10 \)
   \( \Rightarrow V_{oc} = 20 \)
   \[
   4i + 6(I_{sc} - 10) = 0
   \]
   \( i = 10 - I_{sc} \)
   \( \Rightarrow I_{sc} = 10 \)
   \[
   R_{th} = \frac{V_{oc}}{I_{sc}} = \frac{20}{10} = 2\Omega
   \]
   a. \[
   20V
   \]
   b. \( R = R_{th} = 2\Omega \)
7. Since there are no independent sources we know that $V_{oc}$ and $I_{sc}$ are both zero. Thus, we must apply a test voltage to find $R_{th}$.

![Circuit Diagram]

\[ V_T = 3I_T - 4i_1 + 2(I_T - 3v_2) \]
\[ i_1 = I_T - 3v_2 \]
\[ v_2 = -3I_T \]
\[ \Rightarrow V_T = 3I_T - 4(I_T - 3v_2) + 2(I_T - 3v_2) = I_T + 6v_2 \]
\[ \Rightarrow V_T = I_T + 6(-3I_T) = -17I_T \]
\[ \Rightarrow R_{th} = \frac{V_T}{I_T} = -17 \]

Thus, the Norton equivalent is a $-17 \Omega$ resistor.