Piston cylinder

The work done on the gas by the piston is:

Answer: $\frac{1}{4} R \cdot T_1$.

Explanation: Process 2-3 is a constant volume process, so:

$$W_{2-3} = 0$$

Process 1-2 is a constant pressure process, so:

$$W_{1-2} = P \cdot (V_2 - V_1)$$

$$W_{1-2} = R \cdot (T_2 - T_1)$$

$$W_{1-2} = R \cdot \left(\frac{3}{4} T_1 - T_1 \right)$$

$$W_{1-2} = \frac{1}{4} R \cdot T_1$$

Combining the work of the 2 processes gives:

$$W = W_{1-2} + W_{2-3} = \frac{1}{4} R \cdot T_1 + 0$$