A charge of 4 mC is located at the point (12 cm, 0), a charge of -10 mC is located at the origin, and a third charge of 6 mC is located at the point (0, 5 cm). Determine the electric potential at the points A) (10 cm, 0) B) (0, -5 cm) and C) the origin.

\[
A) \quad V(10, 0) = \frac{ke}{1.12^2} + \frac{0.04}{0.02} + \frac{-0.01}{0.1} \quad = \quad 1.38 \times 10^9 \text{V}
\]

\[
B) \quad V(0, -5) = \frac{ke}{1.1^2} + \frac{-0.01}{0.05} + \frac{0.04}{0.13} \quad = \quad -9.83 \times 10^8 \text{V}
\]

\[
C) \quad V(0, 0) = \frac{ke}{0.05} + \frac{0.04}{0.12} \quad = \quad 1.38 \times 10^9 \text{V}
\]

Determine the potential energy of the charges given in the first part.

\[
U = ke \left[ \frac{q_1 q_2}{r_{12}} + \frac{q_2 q_3}{r_{23}} + \frac{q_3 q_4}{r_{34}} \right] = \frac{ke}{0.12} \left[ (0.006)(-0.01) + (0.004)(0.004) \right] \quad = \quad -1.2 \times 10^7 \text{J}
\]

How much work must be done to bring a fourth charge to the point (12 cm, 5 cm)?

\[
q = -10 \text{ mC}
\]

\[
\Delta V = 12, 105 \text{ m} = \frac{ke}{1.12^2} + \frac{0.04}{0.02} + \frac{0.04}{0.13} = 4.78 \times 10^8 \text{V}
\]

\[
W = q \Delta V = (-0.01)(4.78 \times 10^8 \text{V}) \quad = \quad 4.78 \times 10^6 \text{J}
\]