PHYSICS 2220 - QUIZ #3 - SPRING 2009

1. Two charges \( q = -3.0 \ \mu C \) are fixed in space a distance \( d = 4.0 \ \text{cm} \) apart, as shown.

   a. With \( V = 0 \) at infinity, what is the electric potential at point \( C \)?

   \[
   V = k \frac{q}{r} + k \frac{q}{r} = 2k \frac{q}{r}
   \]

   \[
   \text{So} \quad V = 2(8.99 \times 10^9 \frac{\text{Nm}^2}{\text{C}^2}) \left(\frac{-3 \times 10^{-6} \text{C}}{0.02 \sqrt{2} \text{ m}}\right)
   \]

   \[
   = -1.91 \times 10^5 \text{ V}
   \]

   b. You bring a third charge \( Q = -2 \ \mu C \) from infinity to \( C \). How much work do you do?

   Since the work you do is stored as a change in potential energy,

   \[
   W = \Delta U = Q \Delta V = Q (V_f - V_i) \quad \text{at} \quad \infty
   \]

   Therefore

   \[
   W = -2 \times 10^{-6} \text{ C} (1.91 \times 10^5 \text{ V} - 0)
   \]

   \[
   = 3.81 \text{ J}
   \]