Problems

**Problem 1**

Three point charges, \( q_1 = -4 \text{ nC}, q_2 = 5 \text{ nC}, \) and \( q_3 = 3 \text{ nC}, \) are placed as in Fig.

![Figure 1: Three point charges](image)

If \( r_1 = 0.5 \text{ m} \) and \( r_3 = 0.8 \text{ m}, \) find the force on \( q_2 \) due to the other two charges.

**Solution:**

We first find the force on \( q_2 \) due to \( q_1 : \)

\[
F_1 = k \frac{q_1 q_2}{r_1^2} = 9.0 \times 10^9 \times \frac{4 \times 10^{-9} \cdot 5 \times 10^{-9}}{(0.5)^2} = 7.2 \times 10^{-7} \text{ N},
\]

which is directed to the left. The force on \( q_2 \) due to \( q_3 \) is found as:

\[
F_3 = k \frac{q_3 q_2}{r_3^2} = 9.0 \times 10^9 \times \frac{3 \times 10^{-9} \cdot 5 \times 10^{-9}}{(0.8)^2} = 2.11 \times 10^{-7} \text{ N},
\]

which is also directed to the left. Thus, the total force on \( q_2 \) is given by

\[
7.2 \times 10^{-7} + 2.11 \times 10^{-7} = 9.31 \times 10^{-7} \text{ N}.
\]

Thus, the total force on \( q_2 \) is \( 9.31 \times 10^{-7} \text{ N} \) directed to the left.