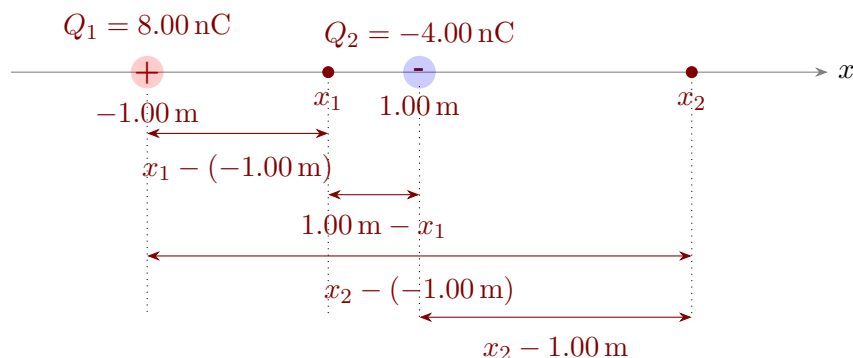


Problem 1: (20 pts.) Two point charges are placed on the x -axis. One point charge, 8.00 nC , is placed at $x = -1.00\text{ m}$, and the second point charge, -4.00 nC , is placed at $x = +1.00\text{ m}$. Find one point along the x -axis (other than infinity) where the electric potential is zero. (There are actually 2 such points, but you only need to find one for this problem.)

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Since $|Q_2| < |Q_1|$, the field point where V equals 0 will have to be closer to Q_2 than to Q_1 . That means it can't be to the left of Q_1 . Consider the other two possibilities:

First, consider a point x_1 , between the two charges. The distances between point x_1 and each of the charges are shown in the figure. Set the potential at x_1 equal to 0, and then solve for x_1 .

$$\begin{aligned}
 V_1 + V_2 &= 0 \\
 \frac{KQ_1}{x_1 - (-1.00\text{ m})} + \frac{KQ_2}{1.00\text{ m} - x_1} &= 0 \\
 \frac{1.00\text{ m} - x_1}{x_1 - (-1.00\text{ m})} &= -\frac{Q_2}{Q_1} \\
 \frac{1.00\text{ m} - x_1}{x_1 - (-1.00\text{ m})} &= -\frac{-4.00\text{ nC}}{8.00\text{ nC}} = \frac{1}{2} \\
 2(1.00\text{ m} - x_1) &= x_1 - (-1.00\text{ m}) \\
 1.00\text{ m} &= 3x_1 \\
 x_1 &= \boxed{0.333\text{ m}}
 \end{aligned}$$

Next, consider a point x_2 , to the right of both charges. The distances between point x_2 and each of the charges are shown in the figure. Set the potential at x_2 equal to 0, and then solve for x_2 .

$$\begin{aligned}
 V_1 + V_2 &= 0 \\
 \frac{KQ_1}{x_2 - (-1.00\text{ m})} + \frac{KQ_2}{x_2 - 1.00\text{ m}} &= 0 \\
 \frac{x_2 - 1.00\text{ m}}{x_2 - (-1.00\text{ m})} &= -\frac{Q_2}{Q_1} \\
 \frac{x_2 - 1.00\text{ m}}{x_2 - (-1.00\text{ m})} &= -\frac{-4.00\text{ nC}}{8.00\text{ nC}} = \frac{1}{2} \\
 2(x_2 - 1.00\text{ m}) &= x_2 - (-1.00\text{ m}) \\
 x_2 &= \boxed{3.00\text{ m}}
 \end{aligned}$$