56. Let $q_1 = -4Q < 0$ and $q_2 = +2Q > 0$ (where we make the assumption that $Q > 0$). Also, let $d = 2.00$ m, the distance that separates the charges. The individual magnitudes $\left|\vec{E}_1\right|$ and $\left|\vec{E}_2\right|$ are figured from Eq. 23-3, where the absolute value signs for q_2 are unnecessary since this charge is positive. Whether we add the magnitudes or subtract them depends on if $\vec{E}_1$ is in the same, or opposite, direction as $\vec{E}_2$. At points left of q_1 (on the $-x$ axis) the fields point in opposite directions, but there is no possibility of cancellation (zero net field) since $\left|\vec{E}_1\right|$ is everywhere bigger than $\left|\vec{E}_2\right|$ in this region. In the region between the charges ($0 < x < d$) both fields point leftward and there is no possibility of cancellation. At points to the right of q_2 (where $x > d$), $\vec{E}_1$ points leftward and $\vec{E}_2$ points rightward so the net field in this range is

$$\vec{E}_{\text{net}} = \left|\vec{E}_2\right| - \left|\vec{E}_1\right| \quad \text{in the } \hat{\mathrm{i}} \text{ direction.}$$

Although $|q_1| > q_2$ there is the possibility of $\vec{E}_{\text{net}} = 0$ since these points are closer to q_2 than to q_1. Thus, we look for the zero net field point in the $x > d$ region:

$$\begin{aligned} \left|\vec{E}_1\right| &= \left|\vec{E}_2\right| \\ \frac{1}{4\pi\varepsilon_0}\frac{|q_1|}{x^2} &= \frac{1}{4\pi\varepsilon_0}\frac{q_2}{(x-d)^2} \end{aligned}$$

which leads to

$$\frac{x-d}{x} = \sqrt{\frac{q_2}{|q_1|}} = \sqrt{\frac{1}{2}} \ .$$

Therefore, $x = \frac{d\sqrt{2}}{\sqrt{2}-1} = 6.8$ m specifies the position where $\vec{E}_{\text{net}} = 0$.