Three charges are at the corners of an equilateral triangle as shown.

(a) Calculate the electric field (magnitude and direction) at point P.

(b) Calculate the force on a charge -Q (magnitude and direction) placed at P.

\[
\begin{align*}
E_x &= E_1^x + E_2^x + E_3^x = \frac{kQ}{a^2} \left( \frac{2}{3} - \sqrt{3} \right) = -1.066 \frac{kQ}{a^2} \\
E_y &= E_1^y + E_2^y + E_3^y = 0 \\
E &= \sqrt{E_x^2 + E_y^2} = 1.066 \frac{kQ}{a^2} \\
\theta &= \text{along negative } x\text{-axis} \quad (\theta = 180^\circ)
\end{align*}
\]

\[
\begin{align*}
F_x &= 2E_x = 2 \cdot \frac{1.066 kQ}{a^2} \left( \frac{2}{3} - \sqrt{3} \right) = 4.26 \frac{kQ^2}{a^2} \\
F_y &= 0 \\
F &= \sqrt{F_x^2 + F_y^2} = 4.26 \frac{kQ^2}{a^2} \\
\theta &= \text{along positive } x\text{-axis} \quad (\theta = 0^\circ)
\end{align*}
\]