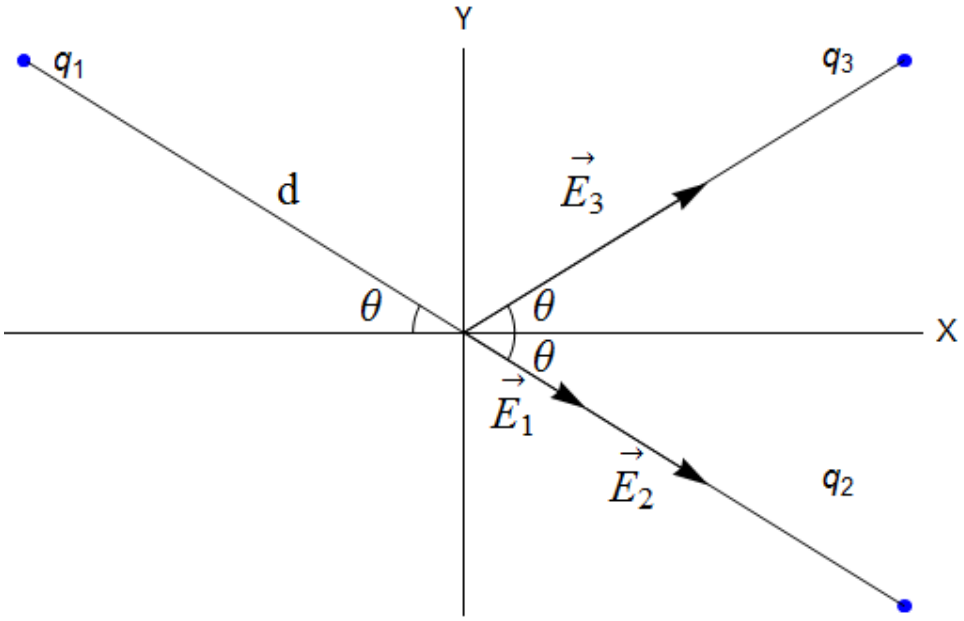
Answer on Question #42907 – Physics – Other

42. Figure shows three particles with charges q_1=+2Q, q_2=-2Q and q_3=-4Q, each a distance d from origin. Find the net electric field **E** at the origin:

Solution.



Due to superposition principle:

$$E_x = E_{1x} + E_{2x} + E_{3x}$$

$$E_y = E_{1y} + E_{2y} + E_{3y}$$

Absolute values of electric field at the origin (directions are shown at the draw)

$$E_1 = \frac{1}{4\pi\varepsilon_0} * \frac{2Q}{d^2};\ E_2 = \frac{1}{4\pi\varepsilon_0} * \frac{2Q}{d^2}; E_3 = \frac{1}{4\pi\varepsilon_0} * \frac{4Q}{d^2}$$

Thus:

$$E_x = \frac{1}{4\pi\varepsilon_0} * \frac{\cos\theta}{d^2}(2Q + 2Q + 4Q) = \frac{8 * \frac{\sqrt{3}}{2} * Q}{4\pi\varepsilon_0 d^2} \approx \frac{6.93Q}{4\pi\varepsilon_0 d^2}$$

$$E_y = \frac{1}{4\pi\varepsilon_0} * \frac{\sin\theta}{d^2}(-2Q - 2Q + 4Q) = 0$$

Answer:(b) $\frac{6.93Q}{4\pi\varepsilon_0 d^2}$ towards+ve x-axis