

11. We place the origin of our coordinate system at point  $P$  and orient our  $y$  axis in the direction of the  $q_4 = -12q$  charge (passing through the  $q_3 = +3q$  charge). The  $x$  axis is perpendicular to the  $y$  axis, and thus passes through the identical  $q_1 = q_2 = +5q$  charges. The individual magnitudes  $|\vec{E}_1|$ ,  $|\vec{E}_2|$ ,  $|\vec{E}_3|$ , and  $|\vec{E}_4|$  are figured from Eq. 23-3, where the absolute value signs for  $q_1, q_2$ , and  $q_3$  are unnecessary since those charges are positive (assuming  $q > 0$ ). We note that the contribution from  $q_1$  cancels that of  $q_2$  (that is,  $|\vec{E}_1| = |\vec{E}_2|$ ), and the net field (if there is any) should be along the  $y$  axis, with magnitude equal to

$$\vec{E}_{\text{net}} = \frac{1}{4\pi\epsilon_0} \left( \frac{|q_4|}{(2d)^2} - \frac{q_3}{d^2} \right) \hat{j} = \frac{1}{4\pi\epsilon_0} \left( \frac{12q}{4d^2} - \frac{3q}{d^2} \right) \hat{j}$$

which is seen to be zero. A rough sketch of the field lines is shown below:

