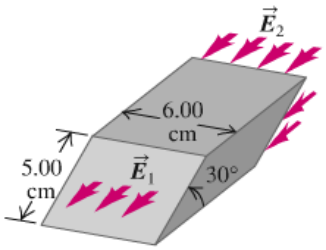
**22.37** •• The electric field $\vec{E}_1$ at one face of a parallelepiped is uniform over the entire face and is directed out of the face. At the opposite face, the electric field $\vec{E}_2$ is also uniform over the entire face and is directed into that face (Fig. P22.37). The two faces in question are inclined at 30.0° from the horizontal, while $\vec{E}_1$ and $\vec{E}_2$ are both horizontal; $\vec{E}_1$ has a magnitude of $2.50 \times 10^4$ N/C, and $\vec{E}_2$ has a magnitude of $7.00 \times 10^4$ N/C. (a) Assuming that no other electric field lines cross the surfaces of the parallelepiped, determine the net charge contained within. (b) Is the electric field produced only by the charges within the parallelepiped, or is the field also due to charges outside the parallelepiped? How can you tell?

Figure **P22.37**




**22.56** • **A Uniformly Charged Slab.** A slab of insulating material has thickness $2d$ and is oriented so that its faces are parallel to the $yz$-plane and given by the planes $x = d$ and $x = -d$. The $y$- and $z$-dimensions of the slab are very large compared to $d$ and may be treated as essentially infinite. The slab has a uniform positive charge density $\rho$. (a) Explain why the electric field due to the slab is zero at the center of the slab ($x = 0$). (b) Using Gauss's law, find the electric field due to the slab (magnitude and direction) at all points in space.

**22.57** • **CALC A Nonuniformly Charged Slab.** Repeat Problem 22.56, but now let the charge density of the slab be given by $\rho(x) = \rho_0 (x/d)^2$, where $\rho_0$ is a positive constant.

4. Suppose that the charge density of the spherical charge distribution inside a sphere with radius R is $\rho(r) = \rho_0 \frac{r}{R}$ for $r \leq R$ and zero for r>R. Obtain expressions for the electric field both inside and outside of the sphere.