

Prob2499: Consider a cube of sides "A" located at the origin. Suppose electric field $\vec{E} = bx^2\hat{i}$. Calculate the flux through each side of the cube and use this to find the charge within the cube.

Answer: (a) Four faces have zero flux.

(b) pme face has $\mathbf{f}_1 = \vec{E} \cdot \vec{A} = (ba^2) \cdot (a^2) = ba^4$

© Face at x=0 has : $\mathbf{f}_2 = 0$

Therefore Net flux from cube = ba^4

$$\therefore \oint_{cube} \vec{E} \cdot d\vec{s} = ba^4 = \left(\frac{q}{\epsilon_0} \right) \Rightarrow q = b\epsilon_0 a^4 \text{ is the total charge inside the cube.}$$

But we cannot say how this charge is distributed (yet).

Charge at any x = $q = b\epsilon_0 x^2 a^2$ and same thing should extend outside cube also !