1 Electric Field and Charge

Consider the electric field

$$\vec{E}(r,\theta,\phi) = \begin{cases} 0 & \text{for } r < a \\ \frac{1}{4\pi\epsilon_0}\frac{Q}{b^3-a^3}\left(r - \frac{a^3}{r^2}\right)\hat{r} & \text{for } a < r < b \\ 0 & \text{for } r > b \end{cases} \tag{1}$$

(a) Use step and/or delta functions to write this electric field as a single expression valid everywhere in space.

(b) Find a formula for the charge density that creates this electric field.

(c) Interpret your formula for the charge density, i.e. explain briefly in words where the charge is.