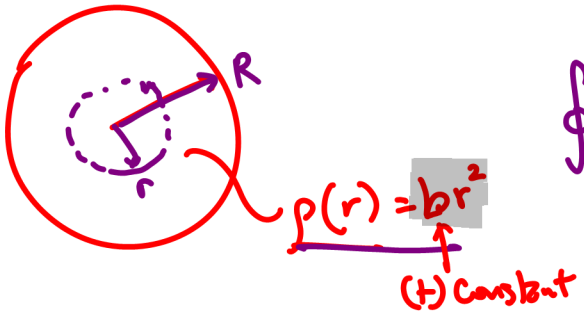
A solid sphere (radius R) with charge density that varies with distance r to the center



$$\oint E \cdot dA = \frac{Q_{enc}}{\varepsilon_0} \rightarrow E \cdot (4\pi r^2) = \frac{4\pi b r^5}{5\varepsilon_0}$$

??? (Qenc)

$$E \cdot A = \frac{Q_{enc}}{\varepsilon_0}$$

$$\boxed{E = \frac{b r^3}{5\varepsilon_0}}$$

What is the electric field inside the sphere?

aside: Volume of a sphere

$$V = \int_0^R dV = \int_0^R (4\pi r^2 dr) = \frac{4}{3}\pi R^3$$

charge:

$$Q = \int dQ = \int \rho dV = \int \rho (4\pi r^2 dr)$$

$$Q_{enc} = \int_0^r dQ = \int \rho(r)\, 4\pi r^2 dr$$

$$= \int (br^2) 4\pi r^2 dr = 4\pi b \int_0^r r^4 dr$$

$$Q_{enc} = \frac{4\pi b}{5} r^5$$