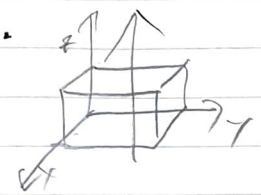
Quiz 4

1. $\sigma_b = P \cdot \hat{n} = P \cdot da$

$a_z = 2 \cdot (\pi r^2)$

$\sigma_b = P\, 2\pi r^2$



$da = x_0 y_0 + x_0 y_0$

$\sigma_b = P(2 x_0 y_0)$

2. $\rho_b = -\nabla \cdot P$

$= -\frac{1}{r^2}\frac{\partial}{\partial r}(P_0 r^3) = -3k$

$\nabla \cdot (f\hat{r}) = -\frac{1}{r^2}\frac{\partial}{\partial r}(r^2 f(r)) + 0 + 0$

$\vec{P} = P_0 P_2(\cos\theta)\hat{r}$

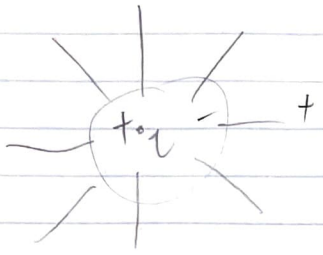
$\frac{1}{r\sin\theta}\frac{\partial}{\partial\theta}(\sin\theta f(\theta))$

$= \frac{P_0 P_2}{r\sin\theta}(\cos\theta\cos\theta - \sin\theta\sin\theta)$

2. $\nabla \cdot D = \rho_f$ $\quad P = \epsilon_0 \chi_e E$ $\quad D = \frac{Q}{4\pi r^2}\hat{r}$

$\oint D \cdot da = Q$ $\quad E = \frac{Q}{4\pi\epsilon r^2}\hat{r}$

$E = \frac{1}{4\pi\epsilon}\int \frac{\rho dV}{r^2}\hat{r}$



$$D = \epsilon_0 E$$

$$E = \frac{1}{\epsilon} D = \frac{1}{\epsilon_r} E_0$$

$$\oint D \cdot dA = q$$

$$D = \frac{q}{4\pi r^2} = \epsilon_0 E$$

$$E = \frac{q}{4\pi r^2 \epsilon_0}$$