2/28/2016 Tune things

$[\vec{L}, S] = 0$ "scalar"

$[\vec{L}, \vec{V}] = i \varepsilon_{ijk} V_k$ "vector"

$\vec{A}, \vec{B}$ vectors $\rightarrow \vec{A} \cdot \vec{B} = A_j B_j =$ scalar

$\rightarrow \vec{A} \times \vec{B} = \varepsilon_{ijk} A_j B_k =$ vector.

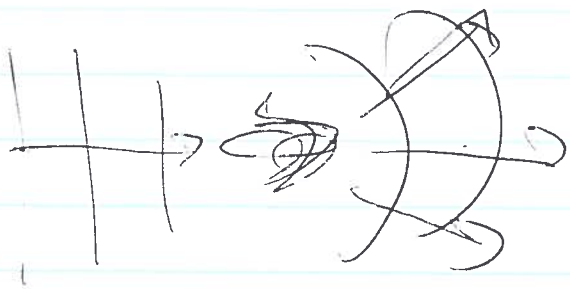
$\vec{x}, \vec{\nabla}$ vectors $\vec{L} = \vec{x} \times \vec{\nabla}$ vector.

$\vec{L} \times \vec{V} = \hat{x}(L_y V_z - L_z V_y) + \hat{y}(L_z V_x - L_x V_z) + \hat{z}(L_x V_y - L_y V_x) = i\vec{V}$

$$\frac{1}{2\ell+1} \sum_{m=-\ell}^{\ell} \left| \vec{X}_{\ell m} \right|^2 = \frac{1}{4\pi}$$

also works for $|Y_{\ell m}|^2$ - why?

Chapter 10: Scattering and diffraction



radiation from source driven by incoming.

cross section = spherical transmission/reflection

$$\frac{d\sigma}{d\Omega} = \frac{(\text{out})}{(\text{in})} = \frac{\text{out per solid angle}}{\text{in per area}} = \frac{(dP/d\Omega)_{out}}{(dP/da)_{in}}$$

in $\quad \vec{E}_{in} = \vec{E}_0 \, e^{i(\vec{k}\cdot\vec{x} - \omega t)}$

out $\quad \vec{E}_{out} = \vec{E}_{sc} = \frac{e^{ikr}}{r} \vec{F}(\theta,\phi)\, e^{-i\omega t}$

$$\langle \vec{S}_{in} \rangle = \frac{1}{2} \vec{E} \times \vec{H}^* = \frac{1}{2Z_0} \vec{E}_0 \times (\hat{k} \times \vec{E}_0)^* = \frac{\hat{k}}{2Z_0} |\vec{E}_0|^2$$

$$\langle \vec{S}_{out} \rangle = \frac{\hat{r}}{2Z_0} \frac{|\vec{F}|^2}{r^2}$$

$$\boxed{\frac{d\sigma}{d\Omega} = \frac{r^2 \, \hat{r}\cdot\vec{S}_{sc}}{\hat{k}\cdot\vec{S}_{in}} = \frac{|\vec{F}|^2}{|E_0|^2}}$$

sensitive to polarization, $|\vec{\epsilon}^* \cdot \vec{F}|^2$, $|\vec{\epsilon}_0 \cdot \vec{E}_0|^2$

often summed over $\hat{\epsilon}$, averaged over $\hat{\epsilon}_0$