PHYS 301
Electricity and Magnetism

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Today!

- Quiz!!
- Vector review
- The Gradient

Vectors: scalar (dot) product

$$\vec{A}\cdot\vec{B} = (A_x B_x) + (A_y B_y) + (A_z B_z)$$

or

$$\vec{A}\cdot\vec{B} = \sum_{i,j=1}^{3} A_i B_j \hat{e}_i \cdot \hat{e}_j = \sum_{i=1}^{3} A_i B_i$$

δ_{ij} = Kronecker delta

commutative and distributive, but not associative!

why not?

Also $\vec{A}\cdot\vec{B} = \left|\vec{A}\right|\left|\vec{B}\right|\cos\theta$

Vectors: vector (cross) product

$$\vec{A}\times\vec{B} = \hat{i}(A_y B_z - A_z B_y) + \hat{j}(A_z B_x - A_x B_z) + \hat{k}(A_x B_y - A_y B_x)$$

or

$$\vec{A}\times\vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ A_x & A_y & A_z \\ B_x & B_y & B_z \end{vmatrix}$$

determinant

distributive, but not commutative

$\vec{A}\times\vec{B} = -\vec{B}\times\vec{A}$

nor associative

$\vec{A}\times(\vec{B}\times\vec{C}) \neq (\vec{A}\times\vec{B})\times\vec{C}$

Also $\vec{A}\times\vec{B} = \left|\vec{A}\right|\left|\vec{B}\right|\sin\theta\,\hat{n}$

direction determined by RH RULE