Force (F. f.) For $\frac{1}{12} \frac{1}{2} \frac{3}{2} \frac{1}{2}$ spont charge For $\frac{1}{12} \frac{1}{2} 1$	- (-)	. ()	
$ \begin{aligned} & F = \langle P F \rangle \text{-} \text{point} \\ & F = \langle D E \text{-} \text{point} \rangle \\ & F = \langle D E \text{-} poin$		$\mathbf{A}_{dip}(\mathbf{r}) = \frac{\mu_0}{4\pi} \frac{\mathbf{m} \times \mathbf{r}}{r^2}$ dipole approx	
$\begin{aligned} & = d \cdot per \ with \ A \\ & = \frac{1}{2} c(E_{bot} + E_{bos}) \ general \\ & = \frac{1}{2} (e \cdot S_b + E_{bos}) \ general \\ & = \frac{1}{2} (e \cdot S_b + E_{bos}) \ general \\ & = \frac{1}{2} (e \cdot S_b + E_{bos}) \ general \\ & = \frac{1}{2} (e \cdot S_b + E_{bos}) \ general \\ & = \frac{1}{2} (e \cdot S_b + E_{bos}) \ general \\ & = \frac{1}{2} (e \cdot S_b + E_{bos}) \ general \\ & = \frac{1}{2} (e \cdot S_b + E_{bos}) \ general \\ & = \frac{1}{2} (e \cdot S_b + E_{bos}) \ general \\ & = \frac{1}{2} (e \cdot S_b + E_{bos}) \ general \\ & = \frac{1}{2} (e \cdot S_b + E_{bos}) \ general \\ & = \frac{1}{2} (e \cdot S_b + E_{bos}) \ general \\ & = \frac{1}{2} (e \cdot S_b + E_{bos}) \ general \\ & = e \cdot S_b \ general \\ & = $	~ <i>V</i>	$\mathbf{A}_{dip}(\mathbf{r}) = \frac{\mu_0}{4\pi} \frac{m \sin \theta}{r^2} \phi \ dip \ at \ origin, \ sphrcl$	\$ /
$ \begin{aligned} & = \frac{1}{2} \eta(x_0) + \xi_{\text{low}} + \xi_{\text{low}} \eta \text{ general} \\ & F = Q(\mathbb{R} + \{v \times \mathbb{R}\}) F_{\text{eff}} \text{ fields } F_{\text{low}} \\ & F = Q(\mathbb{R} + \{v \times \mathbb{R}\}) F_{\text{eff}} \text{ fields } F_{\text{low}} \\ & F = Q(\mathbb{R} + \{v \times \mathbb{R}\}) F_{\text{eff}} \text{ fields } F_{\text{low}} \\ & F = Q(\mathbb{R} + \{v \times \mathbb{R}\}) F_{\text{eff}} \text{ fields } F_{\text{low}} \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit wive } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit wive } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit wive } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit wive } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit wive } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit wive } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit wive } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit wive } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit wive } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit wive } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit wive } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit wive } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit wive } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit wive } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit wive } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit wive } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit with } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit with } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit with } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit with } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit with } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit with } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit with } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit with } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit with } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit with } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit with } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit with } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit with } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit with } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit with } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit with } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit with } w/I \\ & F_{\text{low}} = \int I(d \times \mathbb{R}) \text{ sgrit with } $	•		
$ \begin{aligned} F_{mag} &= f(d \times \mathbb{R}), F_{c} R deds & F_{mag} \\ f(d \times \mathbb{R}), gent wine w/I \\ F_{mag} &= f(d \times \mathbb{R}), gent, const. I \\ F_{mag} &= f(d \times \mathbb{R}), gent, const. I \\ F_{mag} &= f(d \times \mathbb{R}), gent, const. I \\ F_{mag} &= f(d \times \mathbb{R}), gent, const. I \\ Gent &= f(x \times \mathbb{R}), f(x \times \mathbb{R}), gent gent gent gent gent gent gent gent$			
$\begin{aligned} F &= Q(\mathbb{R} + \{\mathbf{v} \times \mathbf{B}\}) \ E+B \ fields \ F_{mag} = f \ field \ B) \ sgart size w f \ Fig. All stress size size size size size size size s$			
$ \int [f(d+2)] symt wire wy I $			$W = \frac{1}{2} \int \partial V dx vol_{-a} density$ $W = \frac{1}{2} \int \partial V dx vol_{-a} density$
$ \begin{aligned} & F_{\text{coop}} = \int \{(d \times \mathbf{R}) \text{ synd wine } w/1 \\ & F_{\text{coop}} = \int \{(\alpha \times \mathbf{R}) \text{ point } - \int \{(\mathbf{K} \times \mathbf{R}) \text{ div soft} \} \\ & F_{\text{coop}} = \int \{(\alpha \times \mathbf{R}) \text{ point } - \int \{(\mathbf{K} \times \mathbf{R}) \text{ div soft} \} \\ & F_{\text{coop}} = \{(\alpha \times \mathbf{R}) \text{ point } - \int \{(\mathbf{K} \times \mathbf{R}) \text{ div soft} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } - \int \{(\mathbf{K} \times \mathbf{R}) \text{ div soft} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } - \int \{(\mathbf{K} \times \mathbf{R}) \text{ div soft} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) \text{ point } \text{ charges} \} \\ & F_{\text{coop}} = \{(\mathbf{K} \times \mathbf{R}) point$			$W = \frac{\epsilon_0}{2} \int E^2 d\tau \ e$ -field all space
$ \begin{aligned} & F_{\text{engy}} = \int \{(\mathbf{d} \times \mathbf{B}) \operatorname{sund}_{t} \cap \{\mathbf{K} \times \mathbf{B}) \operatorname{dent}_{t} \in \mathcal{F} \in \mathcal{A} = \mathcal{F} \setminus \mathcal{B} \cap \mathcal{B} = \mathcal{F} \cap \mathcal{B} \cap \mathcal{B} \\ \operatorname{current}_{t} \operatorname{ang} \mathcal{B} \\ \mathcal{A} = \operatorname{f}_{t} \cap \operatorname{pol}_{t} \operatorname{dens} \\ \mathcal{A} = -\operatorname{f}_{t} \cap \operatorname{pol}_{t} \operatorname{dens} \\ \mathcal{A} \cap \mathcal{B} = \frac{1}{2} \int_{\mathbb{R}^{2}} \mathcal{A} \operatorname{dens}_{t} \operatorname{stendy} \\ \mathcal{A} \cap \mathcal{B} = \frac{1}{2} \int_{\mathbb{R}^{2}} \mathcal{A} \operatorname{dens}_{t} \operatorname{stendy} \\ \mathcal{A} \cap \mathcal{B} = \frac{1}{2} \int_{\mathbb{R}^{2}} \mathcal{A} \operatorname{dens}_{t} \operatorname{stendy} \\ \mathcal{A} \cap \mathcal{B} = \frac{1}{2} \int_{\mathbb{R}^{2}} \mathcal{A} \operatorname{dens}_{t} \operatorname{stendy} \\ \mathcal{A} \cap \mathcal{B} = \frac{1}{2} \int_{\mathbb{R}^{2}} \mathcal{A} \operatorname{dens}_{t} \operatorname{stendy} \\ \mathcal{A} \cap \mathcal{B} = \frac{1}{2} \int_{\mathbb{R}^{2}} \mathcal{A} \operatorname{dens}_{t} \operatorname{stendy} \\ \mathcal{A} \cap \mathcal{B} = \frac{1}{2} \int_{\mathbb{R}^{2}} \mathcal{A} \operatorname{dens}_{t} \operatorname{stendy} \\ \mathcal{A} \cap \mathcal{B} = \frac{1}{2} \int_{\mathbb{R}^{2}} \mathcal{A} \operatorname{dens}_{t} \operatorname{stendy} \\ \mathcal{A} \cap \mathcal{B} = \frac{1}{2} \int_{\mathbb{R}^{2}} \mathcal{A} \operatorname{dens}_{t} \operatorname{stendy} \\ \mathcal{A} \cap \mathcal{B} = \frac{1}{2} \int_{\mathbb{R}^{2}} \mathcal{A} \operatorname{dens}_{t} \operatorname{stendy} \\ \mathcal{A} \cap \mathcal{B} = \frac{1}{2} \int_{\mathbb{R}^{2}} \mathcal{A} \operatorname{dens}_{t} \operatorname{stendy} \\ \mathcal{A} \cap \mathcal{B} = \frac{1}{2} \int_{\mathbb{R}^{2}} \mathcal{A} \operatorname{dens}_{t} \operatorname{stendy} \\ \mathcal{A} \cap \mathcal{B} = \frac{1}{2} \int_{\mathbb{R}^{2}} \mathcal{A} \operatorname{dens}_{t} \operatorname{stendy} \\ \mathcal{A} \cap \mathcal{B} = \frac{1}{2} \int_{\mathbb{R}^{2}} \mathcal{A} \operatorname{dens}_{t} \operatorname{stendy} \\ \mathcal{A} \cap \mathcal{B} \cap B$			
$ \begin{aligned} & F_{mag} = \int (\mathbf{v} \times \mathbf{B}) \mathrm{d} \mathbf{a} = \int (\mathbf{k} \times \mathbf{B}) \mathrm{d} \mathbf{a} \ \mathrm{suf} \ \ \mathcal{E} + \int \hat{\mathbf{E}} \cdot \hat{\mathbf{a}} \cdot \hat{\mathbf{E}} \ \mathrm{d} \mathbf{b} \ \mathrm{def} \ \mathrm{d} \mathbf{e} \\ & F_{mag} = \int (\mathbf{v} \times \mathbf{B}) \mathrm{d} \mathbf{r} = I(\mathbf{J} \times \mathbf{B}) \mathrm{d} \mathbf{r} \ \mathrm{vol} \ \mathrm{d} \\ & = A \cdot \mathbf{f} \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathrm{d} \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathbf{f} \ \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathbf{f} \ \mathbf{e} \\ & = I \cdot \mathbf{f} \cdot \mathbf{f} \ \mathbf{f} \ \mathbf{e} \\ & = I \cdot \mathbf{f} \ \mathbf{f} \ \mathbf{f} \ \mathbf{e} \\ & = I \cdot \mathbf{f} \ \mathbf{f} \ \mathbf{f} \ \mathbf{e} \ \mathbf{f} \ \mathbf{f} \ \mathbf{f} \ \mathbf{e} \\ & = I \cdot \mathbf{f} \ \mathbf{f} \ \mathbf{f} \ \mathbf{e} \ \mathbf{f} \ $			
$ \begin{aligned} & \text{covered}, \text{ any } B \\ & J = 0 - \Gamma / $		$\mathcal{E} = \oint \mathbf{E} \cdot d\mathbf{l} \; E$ -field	
$ \begin{aligned} J_{-} &= r_1 - f_1/r \ vol \ l dens \\ &= r_1 - f_2 + f_2 \\ &= crreati \\ \end{aligned} \end{aligned} $ $ \begin{aligned} \Phi_{-} &= \{ B \ dn \ general \\ \phi_{-} &= A_{11} t \ uo \ loops \\ \phi_{-} &= A_{11} t \ uo \ loops \\ \psi_{-} &= A_{11} t \ uo \ loops \\ \psi_{-} &= A_{11} t \ uo \ loops \\ \psi_{-} &= A_{11} t \ uo \ loops \\ \psi_{-} &= A_{11} t \ loop \\ \psi_{-} &= $	_		$W = \frac{1}{2} \int_{\mathcal{V}} (\mathbf{A} \cdot \mathbf{J}) d\tau \ vol \ I$
$ \begin{aligned} J_{-} &= r_1 - f_1/r \ vol \ l dens \\ &= r_1 - f_2 + f_2 \\ &= crreati \\ \end{aligned} \end{aligned} $ $ \begin{aligned} \Phi_{-} &= \{ B \ dn \ general \\ \phi_{-} &= A_{11} t \ uo \ loops \\ \phi_{-} &= A_{11} t \ uo \ loops \\ \psi_{-} &= A_{11} t \ uo \ loops \\ \psi_{-} &= A_{11} t \ uo \ loops \\ \psi_{-} &= A_{11} t \ uo \ loops \\ \psi_{-} &= A_{11} t \ loop \\ \psi_{-} &= $		$Flux (\Phi)$	$W = \frac{1}{2\mu_0} \int_{\Re} B^2 d\tau \ B \ field$
Electric Pield (E) $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ point charges}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ continuous } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ incar } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ volume } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ volume } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ volume } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ volume } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ volume } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ volume } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ volume } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ volume } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ volume } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ volume } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ volume } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ volume } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ volume } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ volume } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ volume } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ volume } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ volume } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ volume } q \text{-dist}$ $E(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx^2 \text{ volume } q \text{-dist}$ $V(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx \text{ volume } q \text{-dist}$ $V(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx \text{ volume } q \text{-dist}$ $V(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx \text{ volume } q \text{-dist}$ $V(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx \text{ volume } q \text{-dist}$ $V(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx \text{ volume } q \text{-dist}$ $V(r) = \frac{1}{4\pi n} \int_{-\frac{\pi}{2}}^{\infty} \frac{1}{2} dx \text{ volume } q -dis$		v	Energy (W)
Electric Field (E) $ E(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ E(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ E(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ E(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ E(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ E(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ E(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-\pi}^{\pi} \frac{1}{2} \frac{\lambda}{2} dq \text{ continuous } q \text{-dist} \\ F(r) = \frac{1}{4\pi n} \int_{-$			
$ \begin{aligned} \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi c_0} \sum_{j=1}^{2n} \frac{j}{2} \frac{j}{k} a_j \text{ point charges} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j^k \text{ do commons } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j^k \text{ do commons } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j^k \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j^k \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j^k \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j^k \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j^k \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j^k \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j^k \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j^k \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j^k \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j^k \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{2\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{2\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{2\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{2\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{2\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{2\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{2\pi c_0} \int_{j=1}^{2n} \frac{j}{k} a_j \text{ do common } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{2\pi c_0} \int_{j=1}^{2n}$		*	
$ \begin{aligned} \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi n_0} \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{\lambda}{\partial t} & \text{dir minous } q \cdot \text{dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi n_0} \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{\lambda}{\partial t} & \text{dir mor } q \cdot \text{dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi n_0} \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{\lambda}{\partial t} & \text{volume } q \cdot \text{dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi n_0} \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{\lambda}{\partial t} & \text{volume } q \cdot \text{dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi n_0} \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{\lambda}{\partial t} & \text{volume } q \cdot \text{dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi n_0} \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{\lambda}{\partial t} & \text{volume } q \cdot \text{dist} \\ \mathbf{E} &= -\nabla V \text{ expotential} \\ \mathbf{E} &= -\nabla V \text{ expotential} \\ \mathbf{E} &= 0 \text{ mixtde conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} \hat{n} \text{ just outside conductor} \\ \mathbf{E} &= \frac{\pi}{2} n$			
$ \begin{split} \mathcal{E}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{E}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{V}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{V}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{V}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{V}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{V}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{V}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{V}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{V}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{V}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{V}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{V}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}^{*}}{\partial x_{i}^{*}} & \text{div} \text{ incur } q \text{ dist} \\ \mathbf{V}(\mathbf{r}) &= \frac{1}{4\pi a} \int \frac{\partial \mathcal{E}_{i}$	· · ·		
$\begin{array}{lll} & \text{E(r)} = \frac{1}{4\pi\epsilon_0} \int \frac{\partial \mathcal{L}^{p}}{\partial \mathcal{L}^{p}} \mathrm{d}dt' $		*	
$ \begin{array}{c} \mathbf{E}(\mathbf{r}) = \frac{1}{4\pi\sigma_0} \int \frac{p(\mathbf{r}')}{p^2} \frac{\lambda}{p} da' \text{ surface } q\text{-dist} \\ \mathbf{E}(\mathbf{r}) = \frac{1}{4\pi\sigma_0} \int \frac{p(\mathbf{r}')}{p^2} \frac{\lambda}{p} da' \text{ solume } q\text{-dist} \\ \mathbf{F}(\mathbf{E} \cdot \mathbf{da} = \frac{1}{n}) Q_{nc} G\text{-symm } q\text{-dist} \\ \mathbf{E} - \mathbf{O} \text{ mode conductor} \\ \mathbf{E} = 0 \text{ mode conductor} \\ \mathbf{E} = \frac{1}{n} \text{ inst outside conductor} \\ \mathbf{E} = \frac{2}{n} \hat{\mathbf{n}} \text{ inst outside conductor} \\ \mathbf{E} = \frac{2}{n} \hat{\mathbf{n}} \text{ inst outside conductor} \\ \mathbf{E} = \frac{2}{n} \hat{\mathbf{n}} \text{ inst outside conductor} \\ \mathbf{E} = \frac{2}{n} \hat{\mathbf{n}} \text{ inst outside conductor} \\ \mathbf{E} = \frac{2}{n} \hat{\mathbf{n}} \text{ inst outside conductor} \\ \mathbf{E} = \frac{1}{n} \frac{1}{n} (3(\mathbf{p} \cdot \hat{\mathbf{r}}) \hat{\mathbf{r}} - \mathbf{p}) \text{ dipole,}}{2} \\ \mathbf{E} = \frac{1}{n} \hat{\mathbf{n}} \hat{\mathbf{n}} \text{ dist outside conductor} \\ \mathbf{E} = \frac{1}{n} \hat{\mathbf{n}} \hat{\mathbf{n}} \hat{\mathbf{n}} \text{ outside conductor} \\ \mathbf{E} = \frac{1}{n} \hat{\mathbf{n}} \hat{\mathbf{n}} \hat{\mathbf{n}} \text{ outside conductor} \\ \mathbf{E} = \frac{1}{n} \hat{\mathbf{n}} \hat{\mathbf{n}} \hat{\mathbf{n}} \hat{\mathbf{n}} \hat{\mathbf{n}} \hat{\mathbf{n}} \hat{\mathbf{n}} \hat{\mathbf{n}} \\ \mathbf{E} \hat{\mathbf{n}} \hat{\mathbf{n}}$	$\mathbf{E}(\mathbf{r}) = \frac{1}{4\pi\epsilon_0} \int \frac{\lambda(\mathbf{r}')}{\rho^2} \hat{\boldsymbol{\lambda}} dl' \ linear \ q\text{-}dist$		
$ \begin{aligned} & \text{Electric Potential} (V) \\ & \text{$ \not E : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not E : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not E : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not E : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not E : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not E : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not E : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not E : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not E : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not E : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q \text{-dist} \\ & \text{$ \not V : } da = \frac{1}{n^2} Q_{\text{exc}} G \text{-symm } q -dist$	<i>v</i> .		
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$ \begin{array}{lll} \mathbf{F} = -\nabla V & \mathrm{coptential} \\ \mathbf{E} = 0 & \mathrm{inside} & \mathrm{conductor} \\ \mathbf{E} = \frac{\sigma}{\sigma_0} \hat{\mathbf{n}} & \mathrm{just} & \mathrm{outside} & \mathrm{conductor} \\ \mathbf{E} = \frac{\sigma}{\sigma_0} \hat{\mathbf{n}} & \mathrm{just} & \mathrm{outside} & \mathrm{conductor} \\ \mathbf{E} = \frac{\sigma}{\sigma_0} \hat{\mathbf{n}} & \mathrm{just} & \mathrm{outside} & \mathrm{conductor} \\ \mathbf{E} = \frac{\sigma}{\sigma_0} \hat{\mathbf{n}} & \mathrm{just} & \mathrm{outside} & \mathrm{conductor} \\ \mathbf{E} = \frac{\sigma}{\sigma_0} \hat{\mathbf{n}} & \mathrm{just} & \mathrm{outside} & \mathrm{conductor} \\ \mathbf{E} = \frac{\sigma}{\sigma_0} \hat{\mathbf{n}} & \mathrm{just} & \mathrm{outside} & \mathrm{conductor} \\ \mathbf{V}(\mathbf{r}) = \frac{1}{4\pi\sigma_0} \int_{0}^{2} \frac{\nabla \mathcal{E}}{\sigma} & \mathrm{dr}' & \mathrm{volume} & q & \mathrm{dist} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{conductor} \\ \nabla \mathbf{V} = -\frac{1}{4\pi\sigma_0} \int_{0}^{2} \frac{\nabla \mathcal{E}}{\sigma} & \mathrm{dr}' & \mathrm{volume} & q & \mathrm{dist} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{volume} & \mathbf{v} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{volume} & \mathbf{v} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{volume} & \mathbf{v} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{volume} & \mathbf{v} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{volume} & \mathbf{v} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{volume} & \mathbf{v} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{volume} & \mathbf{v} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{volume} & \mathbf{v} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{volume} & \mathbf{v} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{volume} & \mathbf{v} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{volume} & \mathbf{v} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{volume} & \mathbf{v} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{volume} & \mathbf{v} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{volume} & \mathbf{v} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{volume} & \mathbf{v} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{volume} & \mathbf{v} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{volume} & \mathbf{v} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{volume} & \mathrm{dest} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma} & \mathrm{dest} & \mathrm{volume} & \mathrm{dest} \\ \nabla \mathbf{V} = -\frac{1}{\sigma} & \frac{\sigma}{\sigma}$	-11-0 - 12	$V(\mathbf{r}) \equiv \int_{\mathcal{O}=\infty}^{\mathbf{r}} \mathbf{E} \cdot d\mathbf{l} \ def$	
$ \begin{array}{lll} \mathbf{E} = 0 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	$\oint \mathbf{E} \cdot d\mathbf{a} = \frac{1}{\epsilon_0} Q_{enc} \ G\text{-symm } q\text{-}dist$	$V = \sum_{i} V_{i} \ linsup$	
$ \begin{array}{llllllllllllllllllllllllllllllllllll$		$V = \frac{1}{4\pi\epsilon_0} \sum_i \frac{q_i}{2 l_i}$ point charges	
$\begin{array}{llllllllllllllllllllllllllllllllllll$		$V(\mathbf{r}) = \frac{1}{4\pi\epsilon_0} \int \frac{1}{2} dq$ continuous q-dist	
Eq. $(p, q) = \frac{1}{4\pi c_0} \frac{1}{r^3} (3(\mathbf{p} \cdot \hat{\mathbf{r}}) \hat{\mathbf{r}} - \mathbf{p})$ dipole, $(p, q) = \frac{1}{4\pi c_0} \frac{1}{r^3} (3(\mathbf{p} \cdot \hat{\mathbf{r}}) \hat{\mathbf{r}} - \mathbf{p})$ dipole, $(p, q) = \frac{1}{4\pi c_0} \frac{1}{r^3} (3(\mathbf{p} \cdot \hat{\mathbf{r}}) \hat{\mathbf{r}} - \mathbf{p})$ dipole, $(p, q) = \frac{1}{4\pi c_0} \frac{1}{r^3} (3(\mathbf{p} \cdot \hat{\mathbf{r}}) \hat{\mathbf{r}} - \mathbf{p})$ dipole, $(p, q) = \frac{1}{4\pi c_0} \frac{1}{r^3} \frac{1}{r^3} (3(\mathbf{p} \cdot \hat{\mathbf{r}}) \hat{\mathbf{r}} - \mathbf{p})$ dipole, $(p, q) = \frac{1}{4\pi c_0} \frac{1}{r^3} \frac{1}{r^3} (3(\mathbf{p} \cdot \hat{\mathbf{r}}) \hat{\mathbf{r}} - \mathbf{p})$ dipole, $(p, q) = \frac{1}{4\pi c_0} \frac{1}{r^3} \frac{1}{r^3} (3(\mathbf{p} \cdot \hat{\mathbf{r}}) \hat{\mathbf{r}} - \mathbf{p})$ dipole, $(p, q) = \frac{1}{4\pi c_0} \frac{1}{r^3} \frac{1}{r^3} (3(\mathbf{p} \cdot \hat{\mathbf{r}}) \hat{\mathbf{r}} - \mathbf{p})$ dipole, $(p, q) = \frac{1}{4\pi c_0} \frac{1}{r^3} \frac{1}{r^3} \frac{1}{r^3} (3(\mathbf{p} \cdot \hat{\mathbf{r}}) \hat{\mathbf{r}} - \mathbf{p})$ dipole, $(p, q) = \frac{1}{4\pi c_0} \frac{1}{r^3} \frac{1}{r^3} \frac{1}{r^3} \frac{1}{r^3} \hat{\mathbf{r}} \hat{\mathbf{r}} - \mathbf{p})$ dipole, $(p, q) = \frac{1}{4\pi c_0} \frac{1}{r^3} \frac{1}{r^3} \hat{\mathbf{r}} \mathbf{r$		$V(\mathbf{r}) = \frac{1}{4\pi r} \int \frac{\rho(\mathbf{r}')}{\mathbf{p}} d\tau' \text{ volume } q\text{-}dist$	$\nabla \cdot \mathbf{E} = \frac{1}{\epsilon_0} \rho \ e$ -field
$ \begin{array}{c} \operatorname{coordinate-free}^{\circ} \\ \nabla \times \mathbf{E} = 0 \text{ always} \\ \mathbb{E}^{\perp}_{above} - \mathcal{E}_{belown} = \frac{\sigma}{a} \text{ any surf } q \\ \mathbb{E}^{\perp}_{b} + \mathcal{E}_{belown} = \frac{\sigma}{a} \text{ any surf } q \\ \mathbb{E}^{\perp}_{b} + \mathcal{E}_{belown} = \frac{\sigma}{a} \text{ any surf } q \\ \mathbb{E} \in \mathcal{E}_{b} \in \mathbb{N} \text{ conditions} \\ \mathbb{E} \in \mathcal{F} \in \mathcal{E}_{b} \in \mathbb{N} \text{ conditions} \\ \mathbb{E} \in \mathcal{F} \in \mathcal{E}_{b} \in \mathbb{N} \text{ conditions} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r} \text{ farraday} \\ \nabla \times \mathbf{E} = -\frac{\partial \mathbb{B}}{\partial r} \text{ farraday} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = -\frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = \frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = \frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = \frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = \frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = \frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = \frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\ \mathbb{E} = \frac{1}{ab} \int \frac{\partial \mathbb{D}}{\partial r^{2}} \text{ divertines} \\$		0 . -	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	$E_{\text{dip}}(\mathbf{I}) = \frac{1}{4\pi\epsilon_0} \frac{1}{r^3} (S(\mathbf{p} \cdot \mathbf{I})\mathbf{I} - \mathbf{p})$ unpose,	0 ,	·
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$\begin{array}{lll} \mathcal{E} = \oint \mathbf{E} \cdot d\mathbf{I} & \mathrm{emf} \\ \oint \mathbf{E} \cdot d\mathbf{I} & = - \int \frac{\partial \mathbf{B}}{\partial x} \cdot d\mathbf{a} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} & = - \frac{\partial \mathbf{B}}{\partial x} \ Farraday \\ \nabla \times \mathbf{E} &$			
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$\begin{array}{llll} \nabla \times \mathbf{E} = -\frac{\partial \mathbf{H}}{\partial z} \operatorname{Farraday} & \mathbf{V}(\mathbf{r}) = \frac{1}{4\pi \zeta} \sum_{n=0}^{\infty} \sum_{n=1}^{n+1} \\ \int (\partial \mathbf{B}/\partial z) \times \mathbf{\hat{b}} d\tau & E \ frm \ just \ changn \ B \ B \ d = \frac{\mu_0}{4\pi} I \int \frac{d^2 \times \mathbf{\hat{b}}}{2^2} \ steady \ line \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ steady \ vol \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ vol \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ vol \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ vol \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ vol \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ vol \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ vol \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ steady \ I \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ dr' \ d = \frac{\mu_0}{4\pi} \int \frac{(\nabla f)^2 \times \mathbf{\hat{b}}}{2^2} \ d = \frac{\mu_0}{4\pi} \int ($			
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$\begin{array}{llllllllllllllllllllllllllllllllllll$		$V(1) = \frac{1}{4\pi\epsilon_0} \sum_{n=0}^{\infty} \frac{1}{r^{n+1}}$ $\int (r')^n D(r) dr' dr' district = district = 0$	
Magnetic Field (B) $ B(\mathbf{r}) = \frac{\mu_0}{4\pi} I \int \frac{\pi}{2} \frac{\pi}{2} \int \operatorname{steady line } I \\ B(\mathbf{r}) = \frac{\mu_0}{4\pi} I \int \frac{\pi}{2} \frac{\pi}{2} \int \operatorname{steady line } I \\ B(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\pi}{2} \frac{\pi}{2} \int \operatorname{steady line } I \\ B(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\pi}{2} \frac{\pi}{2} \int \operatorname{steady surf } I \\ B(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\pi}{2} \int \frac{\pi}{2} \int \operatorname{steady surf } I \\ B(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\pi}{2} \int \frac{\pi}{2} \int \operatorname{steady vol } I \\ \frac{\pi}{2} \int \operatorname{steady vol } I $			
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$ \oint \mathbf{B} \cdot d\mathbf{l} = \mu_0 I_{enc} A-symm steady I \\ f \mathbf{B} \cdot d\mathbf{l} = \mu_0 \int \mathbf{J} \cdot d\mathbf{a} \ A-symm steady I \\ g \cdot \mathbf{B} = 0 \ always \\ \mathbf{B} = \nabla \times \mathbf{A} \ \text{vec potential} \\ \mathbf{B}_{abv} - \mathbf{B}_{blw} = \mu_0 (\mathbf{K} \times \hat{\mathbf{n}}) \ \text{any at surf } I \\ I = \int_{\mathcal{S}} \mathbf{J} \cdot d\mathbf{a} \ \text{vol } I \ \text{dens} \\ dipole \\ \nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial \mathbf{n}} \frac{1}{r^3} (3(\mathbf{m} \cdot \hat{\mathbf{r}}) \hat{\mathbf{r}} - \mathbf{m}) \ \text{coord-free} \\ \nabla \times \mathbf{E} - \frac{\partial \mathbf{B}}{\partial \mathbf{n}} \frac{\mathbf{F}}{r^3} \mathbf{f} \mathbf{f} \mathbf{f} \mathbf{f} \mathbf{f} \mathbf{f} \mathbf{f} f$	$\mathbf{B}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\mathbf{K}(\mathbf{r}') \times \mathbf{u}}{\hbar^2} da' \text{ steady surf } I$	V_{i} : $(\mathbf{r}) = \frac{1}{2} \frac{\mathbf{p} \cdot \hat{\mathbf{r}}}{2}$ no net charge	
$ \oint \mathbf{B} \cdot d\mathbf{l} = \mu_0 I_{enc} A-symm steady I \\ f \mathbf{B} \cdot d\mathbf{l} = \mu_0 \int \mathbf{J} \cdot d\mathbf{a} \ A-symm steady I \\ g \cdot \mathbf{B} = 0 \ always \\ \mathbf{B} = \nabla \times \mathbf{A} \ \text{vec potential} \\ \mathbf{B}_{abv} - \mathbf{B}_{blw} = \mu_0 (\mathbf{K} \times \hat{\mathbf{n}}) \ \text{any at surf } I \\ I = \int_{\mathcal{S}} \mathbf{J} \cdot d\mathbf{a} \ \text{vol } I \ \text{dens} \\ dipole \\ \nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial \mathbf{n}} \frac{1}{r^3} (3(\mathbf{m} \cdot \hat{\mathbf{r}}) \hat{\mathbf{r}} - \mathbf{m}) \ \text{coord-free} \\ \nabla \times \mathbf{E} - \frac{\partial \mathbf{B}}{\partial \mathbf{n}} \frac{\mathbf{F}}{r^3} \mathbf{f} \mathbf{f} \mathbf{f} \mathbf{f} \mathbf{f} \mathbf{f} \mathbf{f} f$	$\mathbf{B}(\mathbf{r}) = \frac{\mu_0}{2} \int \frac{\mathbf{J}(\mathbf{r}') \times \hat{\boldsymbol{h}}}{2} d\tau' \text{ steady vol } I$	$\partial V_{above} = \partial V_{below} = \sigma$ and sumf a	
$\begin{array}{lll} & \mathbf{\hat{f}} \ \mathbf{B} \cdot \mathbf{dl} = \mu_0 \int \mathbf{J} \cdot \mathbf{da} \ A \cdot symm \ steady \ I \\ \nabla \cdot \mathbf{B} = 0 \ always & \mathbf{Current}, \ (I, \mathbf{I}) \\ \mathbf{B} = \nabla \times \mathbf{A} \ vec \ potential & \mathbf{I} = \lambda v \ moving \ line \ charge \\ \mathbf{B}_{abv} - \mathbf{B}_{blw} = \mu_0 (\mathbf{K} \times \hat{\mathbf{n}}) \ any \ at \ surf \ I \\ \mathbf{B}_{abv} - \mathbf{B}_{blw} = \mu_0 (\mathbf{K} \times \hat{\mathbf{n}}) \ any \ at \ surf \ I \\ \mathbf{B}_{abv} - \mathbf{B}_{blw} = \mu_0 (\mathbf{K} \times \hat{\mathbf{n}}) \ any \ at \ surf \ I \\ \mathbf{B}_{abv} - \mathbf{B}_{blw} = \mu_0 (\mathbf{K} \times \hat{\mathbf{n}}) \ any \ at \ surf \ I \\ \mathbf{B}_{dip}(\mathbf{r}) = \frac{\mu_0 m}{4\pi r^3} (2\cos\theta \hat{\mathbf{r}} + \sin\theta \hat{\boldsymbol{\theta}}) \ due \ to \\ \mathbf{d}_{ipole} & \mathbf{\Phi} = LI \ loop \\ \mathbf{B}_{dip}(\mathbf{r}) = \frac{\mu_0 m}{4\pi r^3} (3(\mathbf{m} \cdot \hat{\mathbf{r}}) \hat{\mathbf{r}} - \mathbf{m}) \ coord\text{-}free \\ \mathbf{G}_{in} - $	-·· · · · · · · · · · · · · · · · · · ·	$\frac{\partial u}{\partial n} - \frac{\partial u}{\partial n} = -\frac{\partial u}{\partial n} \text{any surj } q$ $V = IR \partial hm$	
$ \begin{array}{llllllllllllllllllllllllllllllllllll$			
$\begin{array}{llllllllllllllllllllllllllllllllllll$			$V(r,\theta) = \sum_{l=0}^{\infty} \left(A_l r^l + \frac{B_l}{r^{l+1}} \right) P_l(\cos \theta) \ sph$
$\begin{array}{llllllllllllllllllllllllllllllllllll$			Cartesian Coefficients (A, B, C, D)
$\begin{array}{llllllllllllllllllllllllllllllllllll$	$\mathbf{B}_{abv} - \mathbf{B}_{blw} = \mu_0(\mathbf{K} \times \hat{\mathbf{n}})$ any at surf I	$I = \int_{\mathcal{S}} \mathbf{J} \cdot d\mathbf{a} \ vol \ I \ dens$	
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$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{E}}{\partial t} Farraday \qquad \qquad \mathbf{K} \equiv \frac{d\mathbf{I}}{dl_{\perp}} I \ per \ unit \ width \qquad \qquad$	1	*	
$\nabla \times \mathbf{B} = \mu_0 \mathbf{J} + \mu_0 \epsilon_0 \frac{\partial \mathbf{E}}{\partial t} corrective \mathbf{Magnetic Vector Potential} (\mathbf{A}) \qquad \qquad \mathbf{K} = \sigma \mathbf{v} mobile surf q dens \\ \nabla \cdot \mathbf{A} = 0 always \qquad \qquad \mathbf{J} \equiv \frac{d\mathbf{I}}{da_\perp} I per unit area \\ \mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\mathbf{J}(\mathbf{r}')}{h} d\mathbf{r}' finite vol I dens \\ \mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\mathbf{K}}{h} da' vol I dens \\ \mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\mathbf{K}}{h} da' vol I dens \\ \mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\mathbf{K}}{h} da' vol I dens \\ \mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\mathbf{K}}{h} da' vol I dens \\ \mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\mathbf{K}}{h} da' vol I dens \\ \mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\mathbf{K}}{h} da' vol I dens \\ \mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\mathbf{K}}{h} da' vol I dens \\ \mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \sum_{n=0}^{\infty} \frac{1}{r^{n+1}} \oint (r')^n P_n(\cos \alpha) dl' \\ \mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \left(\frac{1}{r} \oint dl' + \frac{1}{r^2} \oint r' \cos \alpha dl' \\ \mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \left(\frac{1}{r} \oint dl' + \frac{1}{r^2} \oint r' \cos \alpha dl' \\ \mathbf{R}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{1}{r^2} \oint (r')^2 \left(\frac{3}{2} \cos \alpha^2 - \frac{1}{2} \right) dl' + \cdots \right) localized $ $\mathbf{Resistance} (R)$ $\mathbf{R} = \frac{d\mathbf{I}_\perp}{r} loss \mathbf{R} \mathbf{R} dens \mathbf{R} \mathbf{R}$			
netic Vector Potential (A) Volume Current Density (J) $\nabla \cdot \mathbf{A} = 0$ always $\mathbf{J} = \frac{d\mathbf{I}}{da_{\perp}} I$ per unit area $\mathbf{J} = \frac{d\mathbf{I}}{da_{\perp}} I$ per unit	$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t} Farraday$		
$\nabla \cdot \mathbf{A} = 0 \text{ always} \qquad \mathbf{J} \equiv \frac{d\mathbf{I}}{da_{\perp}} I \text{ per unit area} $ $\mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\mathbf{J}(\mathbf{r}')}{\hbar} d\mathbf{r}' \text{ finite vol } I \text{ dens} $ $\mathbf{A}(\mathbf{r}) = \frac{\mu_0 I}{4\pi} \int \frac{1}{\hbar} d\mathbf{I}' \text{ vol } I \text{ dens} $ $\mathbf{A}(\mathbf{r}) = \frac{\mu_0 I}{4\pi} \int \frac{\mathbf{K}}{\hbar} da' \text{ vol } I \text{ dens} $ $\nabla \cdot \mathbf{J} = -\frac{\partial \rho}{\partial t} \text{ local } q \text{ consvtn} $ $\nabla \cdot \mathbf{J} = 0 \text{ magnetostatics} $ $\mathcal{J} = 0 magnetos$			
$\mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\mathbf{J}(\mathbf{r}')}{2} d\mathbf{r}' \text{ finite vol } I \text{ dens}$ $\mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\mathbf{J}(\mathbf{r}')}{2} d\mathbf{r}' \text{ finite vol } I \text{ dens}$ $\mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\mathbf{J}}{2} d\mathbf{l}' \text{ vol } I \text{ dens}$ $\mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\mathbf{K}}{2} d\mathbf{r}' \text{ vol } I \text{ dens}$ $\mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\mathbf{K}}{2} d\mathbf{r}' \text{ vol } I \text{ dens}$ $\mathbf{A}(\mathbf{r}) = \frac{\mu_0}{2} \int \frac{\mathbf{K}}{2} d\mathbf{r}' \text{ vol } I \text{ dens}$ $\nabla \cdot \mathbf{J} = 0 \text{ magnetostatics}$ $\nabla \times \mathbf{B} = \mu_0 \mathbf{J} \text{ B field}$ $\nabla^2 \mathbf{A} = -\mu_0 \mathbf{J} \text{ vec pot}$ $\mathbf{A}(\mathbf{r}) = \frac{\mu_0 I}{4\pi} \sum_{n=0}^{\infty} \frac{1}{r^{n+1}} \oint (\mathbf{r}')^n P_n(\cos \alpha) d\mathbf{l}'$ $\mathbf{J} = \sigma \mathbf{f} \text{ f per unit } \mathbf{q}$ $\mathbf{J} = \sigma \mathbf{E} \text{ resistors, bad conds}$ $\mathbf{A}(\mathbf{r}) = \frac{\mu_0 I}{4\pi} (\frac{1}{r} \oint d\mathbf{l}' + \frac{1}{r^2} \oint r' \cos \alpha d\mathbf{l}'$ $\mathbf{J} = n f \mathbf{q} \mathbf{v}_{ave} \text{ mols, } e^{\cdot s}$ $\mathbf{Resistance} (R)$ Fourier Method (\mathcal{F}) $\mathbf{Legendre Polynomials} (P_l, P_n)$ $\mathbf{Legendre Polynomials} (P_l, P_n)$ $\mathbf{P}_l = P_n \equiv \frac{1}{2^{l} I!} (\frac{d}{dx})^l (x^2 - 1)^l \text{ Rodrigues}$ $\mathbf{Boundary Conditions} (\mathcal{B})$ $\mathcal{B} = \mathcal{B}(V_{in/out}) \text{ (sphr) } e\text{-pot cont. crss}$ $bndry$ $\mathcal{B} = \mathcal{B}(V_0) \text{ surf pot specified}$ $\mathcal{B} = \mathcal{B}(V_0) \text{ surf charge specified}$ $\mathcal{B} = \mathcal{B}(\sigma_0) \text{ surf charge specified}$ $\mathcal{B} = \mathcal{B}(\sigma_0) \text{ surf charge specified}$	· ·		
$\mathbf{A}(\mathbf{r}) = \frac{\mu_0 I}{4\pi} \int \frac{1}{2} d\mathbf{l}' \text{ vol } I \text{ dens} $ $\nabla \cdot \mathbf{J} = -\frac{\partial \rho}{\partial t} \text{ local } q \text{ consvtn} $ $\nabla \cdot \mathbf{J} = -\frac{\partial \rho}{\partial t} \text{ local } q \text{ consvtn} $ $\nabla \cdot \mathbf{J} = 0 \text{ magnetostatics} $ $\mathbf{A}(\mathbf{r}) = \frac{\mu_0 I}{4\pi} \int \frac{\mathbf{K}}{2} d\mathbf{d}' \text{ vol } I \text{ dens} $ $\nabla \cdot \mathbf{J} = 0 \text{ magnetostatics} $ $\mathcal{J} = $		$\mathbf{J} \equiv \frac{1}{da_{\perp}}$ I per unu area $\mathbf{J} = \mathbf{ov} \text{ mobile vol a dens}$	
$\mathbf{A}(\mathbf{r}) = \frac{\mu_0 I}{4\pi} \int \frac{\mathbf{K}}{\hbar} d\mathbf{r}' \ vol \ I \ dens$ $\mathbf{A}(\mathbf{r}) = \frac{\mu_0 I}{4\pi} \int \frac{\mathbf{K}}{\hbar} d\mathbf{r}' \ vol \ I \ dens$ $\nabla \cdot \mathbf{J} = 0 \ magnetostatics$ $\nabla \times \mathbf{B} = \mu_0 \mathbf{J} \ B \ field$ $\nabla \times \mathbf{B} = \mu_0 \mathbf{J} \ B \ field$ $\nabla^2 \mathbf{A} = -\mu_0 \mathbf{J} \ vol \ I \ dens$ $\nabla \times \mathbf{B} = \mu_0 \mathbf{J} \ B \ field$ $\nabla^2 \mathbf{A} = -\mu_0 \mathbf{J} \ vol \ I \ dens$ $\nabla \times \mathbf{B} = \mu_0 \mathbf{J} \ B \ field$ $\nabla^2 \mathbf{A} = -\mu_0 \mathbf{J} \ vol \ I \ dens$ $\nabla \times \mathbf{B} = \mu_0 \mathbf{J} \ B \ field$ $\nabla^2 \mathbf{A} = -\mu_0 \mathbf{J} \ vol \ I \ dens$ $\nabla \times \mathbf{B} = \mu_0 \mathbf{J} \ B \ field$ $\nabla^2 \mathbf{A} = -\mu_0 \mathbf{J} \ vol \ I \ dens$ $\nabla \times \mathbf{B} = \mu_0 \mathbf{J} \ B \ field$ $\nabla^2 \mathbf{A} = -\mu_0 \mathbf{J} \ vol \ I \ dens$ $\nabla \times \mathbf{B} = \mu_0 \mathbf{J} \ B \ field$ $\nabla^2 \mathbf{A} = -\mu_0 \mathbf{J} \ vol \ I \ dens$ $\nabla \times \mathbf{B} = \mu_0 \mathbf{J} \ B \ field$ $\mathbf{B} = \mathcal{B}(V_{in/out}) \ (sphr) \ e-pot \ cont. \ crss$ $bndry$ $\mathbf{B} = \mathcal{B}(V_0) \ surf \ pot \ specified$ $\mathcal{B} = \mathcal{B}(V_0) \ surf \ charge \ specified$ $\mathcal{B} = \mathcal{B}(V_0) \ surf \ charge \ specified$ $\mathcal{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified$ $\mathcal{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified$ $\mathcal{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified$ $\mathcal{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified$ $\mathcal{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified$ $\mathcal{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified$ $\mathcal{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified$ $\mathcal{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified$ $\mathcal{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified$ $\mathcal{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified$ $\mathcal{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified$ $\mathcal{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified$ $\mathcal{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified$ $\mathcal{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified$ $\mathcal{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified$ $\mathcal{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified$ $\mathcal{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified$ $\mathcal{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified$		$\nabla \cdot \mathbf{J} = -\frac{\partial \rho}{\partial t} local \ a \ consvtn$	Legendre Polynomials (P_l, P_n)
$\mathbf{A}(\mathbf{r}) = \frac{\omega_d}{4\pi} \int \frac{\pi}{\hbar} da' \text{ vol } I \text{ dens} \qquad \nabla \times \mathbf{B} = \mu_0 \mathbf{J} B \text{ field} \qquad \mathbf{Boundary Conditions } (\mathcal{B})$ $\frac{\partial \mathbf{A}_{abv}}{\partial n} - \frac{\partial \mathbf{A}_{blw}}{\partial n} = -\mu_0 \mathbf{K} \text{ any at surf } I \qquad \nabla^2 \mathbf{A} = -\mu_0 \mathbf{J} \text{ vec pot} \qquad \mathcal{B} = \mathcal{B}(V_{in/out}) \text{ (sphr) } e\text{-pot cont. } \text{ crss}$ $\mathbf{A}(\mathbf{r}) = \frac{\mu_0 \mathbf{J}}{4\pi} \sum_{n=0}^{\infty} \frac{1}{r^{n+1}} \oint (r')^n P_n(\cos \alpha) d\mathbf{l}' \qquad \mathbf{J} = \sigma \mathbf{f} per \text{ unit } q \qquad \mathbf{b} ndry$ $\mathbf{alph src to field} \qquad \mathbf{J} = \sigma \mathbf{E} resistors, bad conds$ $\mathbf{A}(\mathbf{r}) = \frac{\mu_0 \mathbf{J}}{4\pi} (\frac{1}{r} \oint d\mathbf{l}' + \frac{1}{r^2} \oint r' \cos \alpha d\mathbf{l}' \qquad \mathbf{J} = nfq \mathbf{v}_{ave} \text{ mols, } e's$ $\mathbf{B} = \mathcal{B}(V_{in/out}) \text{ (sphr) } e\text{-pot cont. } \text{ crss}$ $\mathcal{B} = \mathcal{B}(V_0) \text{ surf pot specified}$ $\mathcal{B} = \mathcal{B}(V_0) \text{ surf charge specified}$ $\mathcal{B} = \mathcal{B}(\sigma_0) \text{ surf charge specified}$			$P_l = P_n \equiv \frac{1}{2^l l!} (\frac{d}{dx})^l (x^2 - 1)^l \ Rodrigues$
$\begin{array}{lll} \frac{\partial A_{abv}}{\partial n} - \frac{\partial A_{blw}}{\partial n} = -\mu_0 \mathbf{K} \ any \ at \ surf \ I & \nabla^2 \mathbf{A} = -\mu_0 \mathbf{J} \ vec \ pot \\ \mathbf{A}(\mathbf{r}) = \frac{\mu_0 I}{4\pi} \sum_{n=0}^{\infty} \frac{1}{r^{n+1}} \oint (r')^n P_n(\cos \alpha) d\mathbf{l}' & \mathbf{J} = \sigma \mathbf{f} \ f \ per \ unit \ q \\ \text{alph src to field} & \mathbf{J} = \sigma \mathbf{E} \ resistors, \ bad \ conds \\ \mathbf{A}(\mathbf{r}) = \frac{\mu_0 I}{4\pi} (\frac{1}{r} \oint d\mathbf{l}' + \frac{1}{r^2} \oint r' \cos \alpha d\mathbf{l}' & \mathbf{J} = nfq \mathbf{v}_{ave} \ mols, \ e's \\ + \frac{1}{r^3} \oint (r')^2 (\frac{3}{2} \cos \alpha^2 - \frac{1}{2}) d\mathbf{l}' + \cdots) \ localized & \mathbf{Resistance} \ (R) & \mathbf{Zero} \ (0) \end{array}$	$\mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\mathbf{A}}{\hbar} da' \ vol \ I \ dens$		Boundary Conditions (\mathcal{B})
$\mathbf{A}(\mathbf{r}) = \frac{\mu_0 I}{4\pi} (\frac{1}{r} \oint d\mathbf{l}' + \frac{1}{r^2} \oint r' \cos \alpha d\mathbf{l}' \qquad \mathbf{J} = nfq\mathbf{v}_{ave} \ mols, \ e's + \frac{1}{r^3} \oint (r')^2 (\frac{3}{2} \cos \alpha^2 - \frac{1}{2}) d\mathbf{l}' + \cdots) \ localized \qquad \mathbf{Resistance} \ (R) $ $\mathbf{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified $ $\mathbf{Zero} \ (0)$	$\frac{\partial \mathbf{A}_{abv}}{\partial n} - \frac{\partial \mathbf{A}_{blw}}{\partial n} = -\mu_0 \mathbf{K}$ any at surf I	$\nabla^2 \mathbf{A} = -\mu_0 \mathbf{J} \ vec \ pot$	
$\mathbf{A}(\mathbf{r}) = \frac{\mu_0 I}{4\pi} (\frac{1}{r} \oint d\mathbf{l}' + \frac{1}{r^2} \oint r' \cos \alpha d\mathbf{l}' \qquad \mathbf{J} = nfq\mathbf{v}_{ave} \ mols, \ e's + \frac{1}{r^3} \oint (r')^2 (\frac{3}{2} \cos \alpha^2 - \frac{1}{2}) d\mathbf{l}' + \cdots) \ localized \qquad \mathbf{Resistance} \ (R) $ $\mathbf{B} = \mathcal{B}(\sigma_0) \ surf \ charge \ specified $ $\mathbf{Zero} \ (0)$	$\mathbf{A}(\mathbf{r}) = \frac{\mu_0 1}{4\pi} \sum_{n=0}^{\infty} \frac{1}{r^{n+1}} \oint (r')^n P_n(\cos \alpha) d\mathbf{l}'$		
$+\frac{1}{r^3} \oint (r')^2 (\frac{3}{2} \cos \alpha^2 - \frac{1}{2}) dl' + \cdots) \ localized \mathbf{Resistance} \ (R) $	alph src to field $\mu_0 I (1 + \mu_0 I) = 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1$		
$r_{1} = r_{2} + r_{1} + r_{2} + r_{3} + r_{4} + r_{5} + r_{5$			
1-uisi ai aisiani pis $n=rac{\omega}{\sigma C}$ embedaea metais			2010 (0)
	r-wist at distant pis	$n = \frac{1}{\sigma C}$ embedded metals	

Separation vector

 $\mathbf{z} = \mathbf{r} - \mathbf{r}' \ general$

Charge differential

 $dq = \lambda dl' \ linear \ dist$

 $dq = \sigma da' \ \textit{surface dist}$

 $dq = \rho d\tau' \ volume \ dist$

Line differential

 $d\mathbf{l} = dr\hat{\mathbf{r}} + rd\theta\hat{\theta} + r\sin\theta d\phi\hat{\phi}$

Volume differential

 $d\tau = s'ds'd\phi dz$ cylin

$$d\tau = s'ds'd\phi dz \ cylin$$

$$d\tau = r^2 \sin\theta dr d\theta d\phi \ sphr$$
Boundary Conditions
$$E_{above}^{\perp} - E_{below}^{\perp} = \frac{\sigma}{\epsilon_0} \ any \ surf \ q$$

$$\frac{\partial V_{above}}{\partial n} - \frac{\partial V_{below}}{\partial n} = -\frac{\sigma}{\epsilon_0} \ any \ surf \ q$$

$$\frac{\partial \mathbf{A}_{abv}}{\partial n} - \frac{\partial \mathbf{A}_{blw}}{\partial n} = -\mu_0 \mathbf{K} \ any \ surf \ I$$

 $\mathbf{B}_{abv} - \mathbf{B}_{blw} = \mu_0(\mathbf{K} \times \hat{\mathbf{n}})$ any surf I $V_{in}(R) = V_{out}(R)$ V cont across boundry $V(\theta_1) = V(\theta_2) \ conductor \rightarrow \ equipotential$ Normal Derivative $\frac{\partial V}{\partial n} = \nabla V \cdot \hat{n} \ general$ Dictionary (\mathcal{D}) $\mathcal{D} = \mathcal{N}$ see notes