$$\mathbf{E}(\mathbf{x}) = \frac{1}{4\pi\epsilon_0}\int \rho(\mathbf{x}')\frac{\mathbf{x}-\mathbf{x}'}{|\mathbf{x}-\mathbf{x}'|^3}d^3x'$$ Coulomb's Law (1.5)

$$\delta(f(x)) = \sum_i \frac{1}{\left|\frac{\mathrm{d}f}{\mathrm{d}x}(x_i)\right|}\delta(x-x_i)$$ Delta function Rule 5

$$\oint_S \mathbf{E}\cdot\mathbf{n}\,da = \frac{1}{\epsilon_0}\int_V \rho(\mathbf{x})d^3x$$ Gauss' Law (1.11)

$$\nabla\times\mathbf{E} = 0$$ Curl of electric field (1.14)

$$\mathbf{E} = -\nabla\Phi$$ Electric field in terms of scalar potential (1.16)

$$\Phi(\mathbf{x}) = \frac{1}{4\pi\epsilon_0}\int \frac{\rho(\mathbf{x}')}{|\mathbf{x}-\mathbf{x}'|}d^3x'$$ Scalar potential in terms of charge density (1.17)

$$(\mathbf{E_2}-\mathbf{E_1})\cdot\mathbf{n} = \sigma/\epsilon_0$$ Electric field of a surface distribution (1.22)

$$\nabla^2\Phi = -\rho/\epsilon_0$$ Poisson Equation (1.28)

$$\nabla^2\Phi = 0$$ Laplace Equation (1.29)

$$\nabla^2\left(\frac{1}{|\mathbf{x}-\mathbf{x}'|}\right) = -4\pi\delta(\mathbf{x}-\mathbf{x}')$$ Laplace's equation for a point charge (1.31)

$$G(\mathbf{x},\mathbf{x}') = \frac{1}{|\mathbf{x}-\mathbf{x}'|} + F(\mathbf{x},\mathbf{x}')$$ Green's function for Poisson's equation (1.40)

$$\Phi(\mathbf{x}) = \frac{1}{4\pi\epsilon_0}\int_V \rho(\mathbf{x}')G_D(\mathbf{x},\mathbf{x}')d^3x' = \frac{1}{4\pi}\oint_S (\mathbf{x}')\frac{\partial G_D}{\partial n'}da'$$ Green's function potential Dirichlet B.C.s (1.44)

$$\Phi(\mathbf{x}) = \langle\Phi\rangle_S + \frac{1}{4\pi\epsilon_0}\int_V \rho(\mathbf{x}')G_N(\mathbf{x},\mathbf{x}')d^3x + \frac{1}{4\pi}\oint_S \frac{\partial\Phi}{\partial n'}G_N da'$$ Green's function potential Neumann B.C.s (1.46)

$$W = \frac{\epsilon_0}{2}\int |\nabla\Phi|^2 d^3x = \frac{\epsilon_0}{2}\int |\mathbf{E}|^2\,d^3x$$ Energy stored in electric field (1.54)

$$V_i = \sum_{j=1}^n p_{ij}q_j,\ (i=1,2,...,n) \qquad Q_i = \sum_{j=1}^n C_{ij}V_j,\ (i=1,2,...,n)$$ Capactiance matrix (1.62)

$$W = \frac{1}{2}\sum_{i=1}^n Q_iV_i = \frac{1}{2}\sum_{i=1}^n\sum_{j=1}^n C_{ij}V_iV_j$$ Potential energy of conductor system (1.62)

$$q' = -\frac{a}{y}q, \quad y' = \frac{a^2}{y}$$ Magnitude and position of image charge on sphere (2.4)

$$\Phi = -E_0\left(r - \frac{a^3}{r^2}\right)$$ Scalar potential of conducting sphere in uniform Electric field (2.14)

$$\frac{1}{|\mathbf{x}-\mathbf{x}'|} = 4\pi\sum_{\ell=0}^{\infty}\sum_{m=-\ell}^{\ell}\frac{1}{2\ell+1}\frac{r_<^\ell}{r_>^{\ell+1}}Y_{\ell m}^*(\theta',\phi')Y_{\ell m}(\theta,\phi)$$ Green's function expansion in spherical coordinates (3.70)

Where $r_<(r_>)$ is the smaller (larger) of $|\mathbf{x}|$ and $|\mathbf{x}'|$

	Wiggly	Decaying
Cartesian	$e^{\pm ik_nx},\ A\cos(k_nx)+B\sin(k_nx)$	$e^{\pm k_nx},\ A\cosh(k_nx)+B\sinh(k_nx)$
Cylindrical (3D)	$e^{im\phi},\ AJ_m(k_n\rho)+BY_m(k_n\rho)$	$AI_m(k_n\rho)+BK_m(k_n\rho)$
Cylindrical (2D)	$e^{im\phi}$	$A_0+B_0\ln\rho+\sum A_m\rho^m+B_m\rho^{-m}$
Spherical (ϕ symmetry)	$P_\ell(\cos\theta)$	$A\left(\frac{r}{a}\right)^\ell+B\left(\frac{r}{a}\right)^{-(\ell+1)}$
Spherical (No ϕ symmetry)	$Y_{\ell m}(\theta,\phi)$	$A\left(\frac{r}{a}\right)^\ell+B\left(\frac{r}{a}\right)^{-(\ell+1)}$

$$\int_0^L \sin\left(\frac{n\pi x}{L}\right)\sin\left(\frac{m\pi x}{L}\right)dx = \frac{L}{2}\delta_{nm} \qquad \int_0^L \sin\left(\frac{n\pi x}{L}\right)\cos\left(\frac{m\pi x}{L}\right)dx = \frac{Ln[1+\cos(n\pi)]}{\pi(n^2-1)}$$

$$\int_0^{2\pi}d\phi\int_0^L dz e^{i(m-m')\phi}e^{i\frac{2\pi}{L}(n-n')z} = 2\pi L\delta_{m'm}\delta_{n'n}$$

$J_m(k\rho)\propto(k\rho)^m \quad Y_m(k\rho)\propto(k\rho)^{-m} \quad I_m(k\rho)\propto(k\rho)^m \quad K_m(k\rho)\propto(k\rho)^{-m}$ As their argument approaches zero