ΤΥΠΟΛΟΓΙΟ. Γενικός τύπος Green, $\Phi(\vec{x}) = \int_V \rho(\vec{x}') G(\vec{x},\vec{x}') d\vec{x}' - \frac{1}{4\pi}\oint \Phi(\vec{x}') \frac{\partial G}{\partial n'} da' + \frac{1}{4\pi}\oint G \frac{\partial \Phi}{\partial n'} da'$

Green σφαιρικού φλοιού $G(\vec{x},\vec{x}') = \frac{1}{|\vec{x}-\vec{x}'|} - \frac{a}{x'\left|\vec{x} - \frac{a^2}{x'^2}\vec{x}'\right|}$.

Πολικές συντεταγμένες, $\vec{\nabla} = \frac{\partial}{\partial \rho}\vec{e}_\rho + \frac{1}{\rho}\frac{\partial}{\partial \phi}\vec{e}_\phi$, $\vec{\nabla}^2 = \frac{1}{\rho}\frac{\partial}{\partial \rho}\left(\rho\frac{\partial \Phi}{\partial \rho}\right) + \frac{1}{\rho^2}\frac{\partial^2 \Phi}{\partial \phi^2} = 0$,

$\Phi(\rho,\phi) = A_0 + B_0 \ln\rho + \sum (A_\nu \rho^\nu + B_\nu \rho^{-\nu})(C_\nu \cos\nu\phi + D_\nu \sin\nu\phi)$ +

Σφαιρικές, $\vec{\nabla} = \vec{e}_r \frac{\partial}{\partial r} + \vec{e}_\theta \frac{1}{r}\frac{\partial}{\partial \theta} + \vec{e}_\phi \frac{1}{r\sin\theta}\frac{\partial}{\partial \phi}$ $\quad \Phi(r,\theta,\phi) = \sum_{lm} (A_{lm} r^l + B_{lm} r^{-(l+1)}) Y_{lm}(\theta,\phi)$

πολυώνυμα Legendre, $P_0(x) = 1$, $P_1(x) = x$, $P_2(x) = \frac{1}{2}(3x^2-1)$. $\quad \int_{-1}^{1} P_l(x) P_{l'}(x) dx = \frac{2}{2l+1}\delta_{ll'}$

Σφαιρικές αρμονικές, $Y_{lm}(\theta,\phi) = \sqrt{\frac{2l+1}{4\pi}\frac{(l-m)!}{(l+m)!}}\, P_l^m(\cos\theta) e^{im\phi}$, $\quad P_l^m(x) = (-1)^m (1-x^2)^{m/2} \frac{d^m P_l(x)}{dx^m}$

Ορθοκανονικότητα Y_{lm}, $\int_0^{2\pi} d\phi \int_0^{\pi} \sin\theta d\theta\, Y^*_{l'm'}(\theta,\phi) Y_{lm}(\theta,\phi) = \delta_{ll'}\delta_{mm'}$

$\cos\gamma = \cos\theta\cos\theta' + \sin\theta\sin\theta'\cos(\phi-\phi')$.

Ορθοκανονικότητα καρτεσιανών,

$\int_0^L \sqrt{\frac{2}{L}}\sin\left(\frac{n\pi x}{L}\right)\sqrt{\frac{2}{L}}\sin\left(\frac{m\pi x}{L}\right) dx = \delta_{nm}$

πολικές, $\int_0^{2\pi} \sin(n\phi)\sin(m\phi)\, d\phi = \pi \cdot \delta_{nm}$.

Τυπολόγιο Laplace in spherical coordinates, $\frac{1}{r}\frac{\partial^2}{\partial r^2}(r\Phi) + \frac{1}{r^2\sin\theta}\frac{\partial}{\partial\theta}\left(\sin\theta\frac{\partial\Phi}{\partial\theta}\right) + \frac{1}{r^2\sin^2\theta}\frac{\partial^2\Phi}{\partial\phi^2} = 0$.

σχέση πληρότητας $\sum_{lm} Y^*_{lm}(\theta',\phi') Y_{lm}(\theta,\phi) = \delta(\phi-\phi')\delta(\cos\theta - \cos\theta')$. $\delta(\vec{x}-\vec{x}') = \frac{\delta(r-r')}{r^2}\delta(\phi-\phi')\delta(\cos\theta-\cos\theta')$.

Ελλειπτικές διαφορικές εξισώσεις $\vec{\nabla}^2\psi(\vec{x}) + [f(\vec{x})+\lambda]\psi(\vec{x}) = 0$, $G(\vec{x},\vec{x}') = 4\pi\sum_n \frac{\psi_n^*(\vec{x}')\psi_n(\vec{x})}{\lambda_n - \lambda}$.

κυλινδρικές συντεταγμένες, $\Phi(\rho,\phi,z) = R(\rho)\, Q(\phi)\, Z(z)$, $R(\rho) = C J_m(k\rho) + D N_m(k\rho)$ με $Z = E\sinh kz + F\cosh kz$

ή $R(\rho) = C I_\nu(x) + D K_\nu(x)$ με $Z(z) = E\sin kz + F\cos kz$

$Q(\phi) = A\cos m\phi + B\sin m\phi$.

$\Phi(\vec{x}) = \frac{q}{r} + \frac{\vec{p}\cdot\vec{x}}{r^3} + \frac{1}{2}\sum_{ij} Q_{ij}\frac{x_i x_j}{r^5} + \dots$ $\quad \vec{p} = \int \rho(\vec{x}')\vec{x}' d\vec{x}'$, $Q_{ij} = \int (3x_i'x_j' - r'^2\delta_{ij})\rho(\vec{x}') d\vec{x}'$

$W = q\Phi(0) - \vec{p}\cdot\vec{E}(0) - \frac{1}{6}\sum_{ij} Q_{ij}\frac{\partial E_j}{\partial x_i}(0) + \dots$

$\vec{\nabla}\times\vec{E} = \vec{0}$, $\vec{\nabla}\cdot\vec{D} = 4\pi\rho$, $\vec{D} = \vec{E} + 4\pi\vec{P}$, $\vec{P} = \chi\vec{E}$, $\vec{D} = \varepsilon\vec{E}$

$\vec{\nabla}\times\vec{B} = \frac{4\pi\vec{J}}{c}$, $\vec{\nabla}\cdot\vec{B} = 0$, $\vec{B} = \mu\vec{H}$ $\quad (\vec{H} = \vec{B} - 4\pi\vec{M})$ $\quad \vec{H}_{in} = -\frac{4\pi\vec{M}}{3}$, $\vec{B}_{in} = \frac{8\pi}{3}\vec{M}$

$\Phi_M(\vec{x}) = -\vec{\nabla}\cdot\int_V \frac{\vec{M}(\vec{x}')}{|\vec{x}-\vec{x}'|} d\vec{x}'$, $\quad \Phi_M(\vec{x}) = -\int_V \frac{\vec{\nabla}'\cdot\vec{M}(\vec{x}')}{|\vec{x}-\vec{x}'|} d\vec{x}' + \oint_S \frac{\hat{n}'\cdot\vec{M}(\vec{x}')}{|\vec{x}-\vec{x}'|} da'$

ΤΥΠΟΛΟΓΙΟ

$\vec{\nabla}\cdot\vec{D} = 4\pi\rho$, $\vec{\nabla}\cdot\vec{B} = 0$, $\vec{\nabla}\times\vec{E} = -\frac{1}{c}\frac{\partial\vec{B}}{\partial t}$, $\vec{\nabla}\times\vec{H} = \frac{4\pi\vec{J}}{c} + \frac{1}{c}\frac{\partial\vec{D}}{\partial t}$. $\vec{D} = \varepsilon\vec{E}$, $\vec{B} = \mu\vec{H}$. $\vec{B} = \vec{\nabla}\times\vec{A}$, $\vec{E} = -\vec{\nabla}\Phi - \frac{1}{c}\frac{\partial\vec{A}}{\partial t}$.

$\psi(\vec{x},t) = \frac{1}{2\pi}\int_{-\infty}^{+\infty}\tilde{\psi}(\vec{x},\omega) e^{-i\omega t} d\omega$, $\tilde{\psi}(\vec{x},\omega) = \int_{-\infty}^{+\infty}\psi(\vec{x},t) e^{i\omega t} dt$

$\vec{F} = q\left(\vec{E} + \frac{\vec{v}}{c}\times\vec{B}\right)$, $\vec{g} = \frac{1}{4\pi c}(\vec{E}\times\vec{B})$ (στο κενό)

$u_e = \frac{1}{8\pi}\vec{E}\cdot\vec{D}$, $u_m = \frac{1}{8\pi}\vec{B}\cdot\vec{H}$, $\vec{S} = \frac{c}{4\pi}(\vec{E}\times\vec{H})$,

$\vec{S} = \mathrm{Re}\left[\frac{c}{8\pi}(\vec{E}\times\vec{H}^*)\right]$, $\vec{B} = \frac{c}{\omega}[\vec{k}\times\vec{E}]$

$r = r_R + i r_I$, $\cos r = \cos r_R \cosh r_I - i\sin r_R \sinh r_I$, $\sin r = \sin r_R \cosh r_I + i\cos r_R \sinh r_I$

$\epsilon(\omega) = 1 + \frac{4\pi N e^2}{m}\sum_i f_i(\omega_i^2 - \omega^2 - i\omega\gamma_i)^{-1}$, $Z = \sum f_i$, $\omega_p^2 = 4\pi N Z e^2/m$

$\sigma = f_0 N e^2/[m(\gamma_0 - i\omega)]$.

$u(x,t) = \frac{1}{\sqrt{2\pi}}\int A(k) e^{ikx - i\omega(k)t} dk$, $A(k) = \frac{1}{\sqrt{2\pi}}\int u(x,0) e^{-ikx} dx$

Kramers - Kronig $\quad \varepsilon(\omega) = 1 + \frac{1}{\pi i} P\int_{-\infty}^{+\infty}\frac{[\epsilon(\omega')-1]}{\omega'-\omega} d\omega'$