

- Consider an infinite plane with potential $\phi = 0$ and a point charge. Determine the scalar potential and the electric field. Plot them (use VectorPlot3D).

Now write down the Green's function of the plane. Consider a disk with radius R within the plane being set at a potential $V_0 e^{-ar}$. There is no external charge. Determine and plot the potential and the electric field. Determine the total charge on the plane.

If you prefer you can do something similar for a sphere.

- Write a program to describe the motion of a charge in a given arbitrary electric and magnetic field (see <http://itp.tu-graz.ac.at/LV/arrigoni/QM/charge-dynamics.nb>

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Solve it for the case of E and B constant and mutually perpendicular.

Solve it for the case of a charge in an electromagnetic wave.

Solve it for the case of a Penning Trap consisting of a magnetic field in z -direction and a quadrupole electric field.

Solve it for the case of a Paul Trap

- Do the some of the problems above for the relativistic case.