

PHY 272: FIELDS
PROBLEM SET 6
due February 11, before class

A. Just to make sure we are in the same page ...

Let $\mathbf{r}_1 = 3\hat{x} - 2\hat{z}$ and $\mathbf{r}_2 = \hat{y} + 4\hat{z}$. Find

$$\mathbf{R} = \frac{\mathbf{r}_1 - \mathbf{r}_2}{|\mathbf{r}_1 - \mathbf{r}_2|^3}. \quad (1)$$

If you give me a scalar as the answer a kitten will be killed.

B. Connected conducting balls

A conducting wire is attached to an initially charged spherical conducting shell of radius $2a$. The other end of the wire is attached to the outer surface of a neutral conducting spherical shell of radius a that is located a very large distance away (at infinity). When electrostatic equilibrium is reached, what is the charge on the shell of radius $2a$? Explain your reasoning.

C. Parallel charged planes

Two infinite planes have surface charge densities σ and $-\sigma$. Find the electric field and the electric potential in all regions of space.

D. Cylindrical capacitor

An infinite cylinder of radius R is charged with surface charge density σ . Along its axis there is a linear charge distribution with linear charge density $\lambda = -2\pi R\sigma$. Find the electric field and electric potential in all regions of space.
