OOP problem set #2

(4 p.) Prepare a Java class representing a system of N point electric charges, statically distributed in 3D space.

Provide one constructor that takes as an argument the number of charges in the system (N).

Provide the following methods:

- specifying the charge parameters for each charge (the coordinates for each charge, and the value of the charge)

- printing the value of the charges and the total charge in the system

- calculating and returning the electric field at any point at the space (an additional argument n means that n-th charge is excluded, we need this feature further to avoid self-interaction)

- calculating and returning the force acting on any charge k (we need to exclude it from the field, otherwise we have infinite self-interaction, if you use the electric field created in the previous method)

- printing the forces acting on each charge

(3 p.) Based on the documentation of Graphics and Graphics2D classes and tutorial *2D Graphics* add to your class a method which creates a PNG file illustrating the position of all the charges in the x-y plane, the charge size should be proportional to its value, and the color should indicate if it is positive or negative.

(3 p.) Using your class set a system of the following 4 charges:

q=2 μC at the position (0,-1,0) meter

q=-2 μC at the position (0,2,0) meter

q=1 μC at the position (1,-1,0) meter

q=-1 μC at the position (1,1,0) meter

Print the values of the charges and the total charge in the system. Print the forces acting on each charge. Create an image showing the charges.