

MATLAB EXERCISE 1.32 Sphere with a uniform volume charge. In MATLAB, plot the dependence on the radial distance from the sphere center (r) of the charge density and electric field intensity, respectively, inside and outside a sphere of radius $a = 1$ m with a uniform volume charge density $\rho = 1$ nC/m³ in free space, based on Eq.(1.47) (from the book). (*ME1-32.m on IR*)

SOLUTION:

The plots obtained in MATLAB are shown in Fig.S1.19.

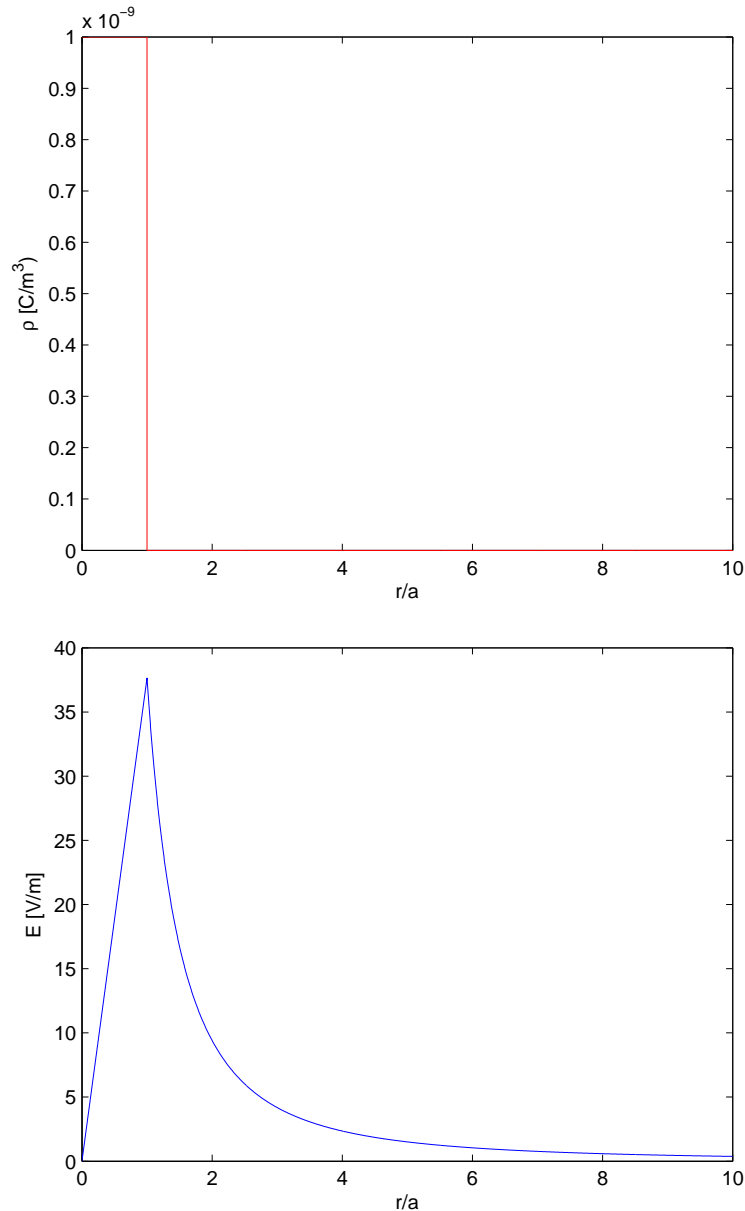


Figure S1.19 MATLAB plots of the dependence on the radial distance from the sphere center of the charge density and electric field intensity, respectively, inside and outside a sphere of radius $a = 1$ m with a uniform volume charge density $\rho = 1$ nC/m³ in free space; for MATLAB Exercise 1.32.

```
%  
% Book: MATLAB-Based Electromagnetics (Pearson Prentice Hall)  
% Author: Branislav M. Notaros  
% Instructor Resources  
% (c) 2011  
%  
% This MATLAB code or any part of it may be used only for  
% educational purposes associated with the book  
%  
%  
% Sphere with a uniform volume charge  
  
clear all;  
close all;  
  
EPS0 = 8.8542*10^(-12);  
a = 1;  
rho0 = 1*10^(-9);  
r1 = 0:0.001*a:a;  
r2 = a:0.005*a:10*a;  
r = [r1 r2];  
  
rho = [rho0*ones(1,length(r1)) zeros(1,length(r2))];  
Ein = rho0*r1./(3*EPS0);  
Eout = (rho0*a^3/3/EPS0)./r2.^2;  
E = [Ein Eout];  
figure(1);  
plot(r,rho,'r');  
xlabel('r/a');  
ylabel('\rho [C/m^3]');  
figure(2);  
plot(r,E);  
ylabel('E [V/m]');  
xlabel('r/a');
```