

MATLAB EXERCISE 1.35 **Differential Gauss' law – spherical symmetry.** Using the program developed in the previous MATLAB exercise, show that the electric field with a radial spherical component only given by Eq.(1.47) (from the book) is produced by a uniformly charged sphere of radius a and charge density ρ in free space. (*ME1-35.m on IR*)

SOLUTION:

The result appears in the Command Window (using MATLAB function `pretty`) as follows:

Charge density is given by the following expressions:

For $r \leq a$:

ρ

For $r > a$:

0

```
%
% 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
%
%
% Differential Gauss' law -- spherical symmetry

clear all;
close all;
syms r theta phi
rho = sym('rho','positive');
a = sym('a','positive');
EPS0 = sym('EPS0','positive');
Er1 = rho*r/3/EPS0;
Er2 = rho*a^3/3/EPS0/r^2;
rho1 = divSph(Er1,0,0)*EPS0;
rho2 = divSph(Er2,0,0)*EPS0;
fprintf('\nCharge density is given by the following expressions: ');
fprintf('\nFor r <=a :');
pretty(rho1);
fprintf('\nFor r > a :');
pretty(rho2);
```