MATLAB EXERCISE 1.31 **Symbolic expression for the electric dipole field.** For the electric dipole in Fig.1.19 (from the book), obtain the expression for the electric field vector in Eq.(1.43) (from the book) from the expression for the electric potential in Eq.(1.42) (from the book) – using MATLAB. In particular, apply the symbolic function for the gradient in spherical coordinates, function `gradSph` (from MATLAB Exercise 1.26), to the expression for V. *(ME1_31.m on IR)*

SOLUTION:

The resulting symbolic expression for the electric field vector of the dipole, as displayed in the Command Window (using MATLAB function `pretty`), is shown in Fig.S1.18.

```
+-                                          -+
|  p cos(theta)  p sin(theta)                |
|  ------------, ------------, 0             |
|              3             3               |
|  2 EPS0 PI r   4 EPS0 PI r                 |
+-                                          -+
```

Figure S1.18 Display in the Command Window in MATLAB of the obtained symbolic expression for the electric field vector of the electric dipole in Fig.1.19 (from the book); for MATLAB Exercise 1.31.

```
%
%   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
%
%
%


%     Symbolic expression for the electric dipole field


clear all;
close all;
syms EPS0 p r phi theta

V = p*cos(theta)/(4*pi*EPS0*r^2);

[Er,Et,Ep] = gradSph(-V);
E = [Er,Et,Ep];
pretty(E);
```