ECE 175: Computer Programming for Engineering Applications

Lab Assignment #7 (Wednesday sessions)

Relevant Programming Concept: String and Struct

Problem 1 (15 points): Write a C program that

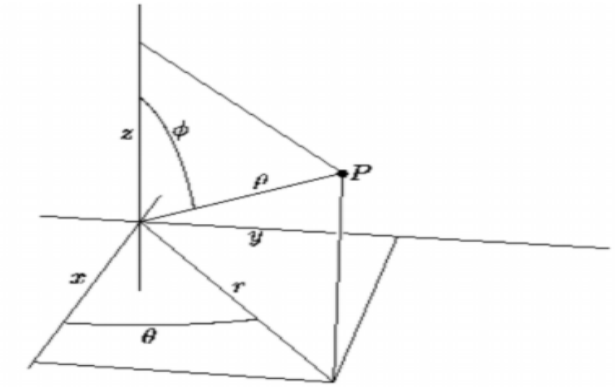
- lets a user enter a word
- prints its plural form using the following rules:
  a) if a noun ends with 'y', remove the 'y' and add 'ies'
  b) if a noun ends in 's', 'ch', or 'sh', add 'es'
  c) in all other cases, add 's'

Sample code executions: Bold entered by a user

Enter a word: **graph**
graph graphs
Enter a word: **butterfly**
butterfly butterflies
Enter a word: **church**
church churches
Enter a word: **class**
class classes
Enter a word: **clue**
clue clues

More test cases: airbrush, circus, circuit, secretary, supply

Problem 2 (15 points) Conversion from Cartesian coordinate to Spherical coordinate
Write an interactive C program that can perform a conversion from Cartesian coordinate to Spherical coordinate.



The relationship between Cartesian coordinate (x, y, z) and Spherical coordinate (rho, theta, phi) is

$$\rho(rho) = \sqrt{x^2 + y^2 + z^2}$$

$$\theta(theta) = \left(\frac{y}{x}\right)$$

$$\emptyset(phi) = \left(\frac{\sqrt{x^2 + y^2}}{z}\right)$$

Your code **MUST** use the given two structures to declare variables of type cartesian and spherical, respective.

```
typedef struct cartesian_s {
        double x, y, z;
} cartesian;

typedef struct spherical_s {
        double rho;
        double theta_degree;
        double phi_degree;
} spherical;
```

Note: Use pi = 3.14159 and the atan2 function in math.h for ( ) . See http://www.cplusplus.com/reference/cmath/atan2/ how to use the atan2 function,
If your code does not use the given two structures, 10 points will be deducted.

Sample Code Execution: **Bold** indicates information entered by the user

Enter Cartesian coordinate values for x, y and z:**0 0 0**
its spherical value: rho = 0.000, theta (degrees) = 0.000, phi (degrees) = 0.000
Continue (n for no)? **t**
Enter Cartesian coordinate values for x, y and z:**4.5 0 0**
its spherical value: rho = 4.500, theta (degrees) = 0.000, phi (degrees) = 90.000
Continue (n for no)? **y**
Enter Cartesian coordinate values for x, y and z:**0 17.5 0**
its spherical value: rho = 17.500, theta (degrees) = 90.000, phi (degrees) = 90.000
Continue (n for no)? **g**
Enter Cartesian coordinate values for x, y and z:**0 0 -5.0**
its spherical value: rho = 5.000, theta (degrees) = 0.000, phi (degrees) = 180.000
Continue (n for no)? **d**
Enter Cartesian coordinate values for x, y and z:**0 -3 4**
its spherical value: rho = 5.000, theta (degrees) = -90.000, phi (degrees) = 36.870
Continue (n for no)? **a**
Enter Cartesian coordinate values for x, y and z:**6.25 -6.25 5.08**
its spherical value: rho = 10.195, theta (degrees) = -45.000, phi (degrees) = 60.113
Continue (n for no)? **n**