Chem/Stat3240: Homework 1a
Mathematica

August 29, 2016

1. An oblate spheroid such as the Earth is obtained by revolving an ellipse about its minor axis. In everyday terms, it is the shape of a slightly compressed beach ball. The Earth's equatorial radius is about 20km longer than its polar radius.

   The surface area of an oblate spheroid is given by

   $$A(r_1, r_2) = 2\pi \left(r_1^2 + \frac{r_2^2}{\sin(\gamma)} \ln \left(\frac{1 + \sin(\gamma)}{\cos(\gamma)} \right) \right) \tag{1}$$

   where r_1 is the equatorial radius, r_2 is the polar radius, and

   $$\gamma = \arccos \left(\frac{r_2}{r_1} \right) \tag{2}$$

   We assume $r_2 < r_1$. Write the code (a script for the body of the template function) that takes r_1 and r_2 as given (the function inputs) and computes $A(r_1, r_2)$. Also compute the surface area approximation given by

   $$A(r_1, r_2) \approx 4\pi((r_1 + r_2)/2)^2 \tag{3}$$

2. For this problem, you are to write code that takes a given temperature and two capital letters designating which temperature scale is being converted to which. For example, `tConverterIf(100,'C','F')` requires 100 degrees Celsius be converted to Fahrenheit. Use the `If` construct to code the conversion.

   The test suite includes all 16 possible combinations: C to F, C to R, C to C, C to K, K to F, K to R, etc. (Yes, the redundant combinations are included.).

For reference, temperature conversion formulas are available at http://en.wikipedia.org/wiki/Temperature_conversion

Submit your code as a function in the file `tConverterIf.nb` to the collab site. .

3. Rewrite the code in the previous problem using the `Which` construct instead of the `If` construct.

   Submit your code as a function in the file `tConverterWhich.nb` to the collab site.

Remember to comment your code as shown in the example below

```
In[11]:= sphereArea[r_] :=
           (* sphereArea(r):Calculates the surface area of a sphere given the radius
           INPUT:
             r:sphere radius
           OUTPUT:
             A=surface area *)

           (* Compute the area of a sphere of radius r *)
           A = 4. * Pi * r ^ 2;
```