Prof. Dr. F. Sadlo, D. Aumiller *Heidelberg, October 24, 2016*

Exercise Sheet 1

Assignment 1.1 Circle Calculation [3 Points]

Write a C++ program that calculates the area and circumference of a circle. The user should be prompted to input the radius interactively. If the input is invalid, show a respective error message. A correct result should be displayed together with an appropriate output message. For π, please use the approximation of 3.1415.

Assignment 1.2 Iterative Computation [3 Points]

In this task you should perform an interative computation, in which the preceding value is used to compute a new one. Given the iteration rule

$$f_{n+1} = a \cdot f_n \cdot (1 - f_n)$$

and a starting value $f_0 = 0.5$, write a C++ program that computes the resulting values $f_{100}, f_{101}, f_{102}, f_{103}$, and f_{104} for values $a = 2.0, 2.1, ..., 3.8, 3.9$.
Output each value of a with the respective f_n's.

Assignment 1.3 Scene Manager Class [7 Points]

In this task, we will create a simple scene manager class. Each scene consists of multiple mesh objects. It should be possible to add a new mesh object to the scene and input the following properties:

- ID of object (can be assigned automatically)
- number of vertices
- vector position of center
- number of faces
- name (need not be unique)
- scaling properties (only use one scale value)

Store the mesh objects in a single-linked list.

1. Design a data structure based on the exercise description for the scene manager class and a mesh object. [*1 Point*]
2. Implement the interaction with the program based on simple command line requests followed by user inputs, including the following actions: [*3 Points*]
   - add a new mesh object
   - remove a mesh object

- list the existing objects in ascending order
- exit the program

3. When the program is terminated, the current objects should be stored in a text file.
   Hint: Separate the properties by a newline. [*1.5 Points*]
4. The saved data has to be read in from the file the next time the program is run.
   [*1.5 Points*]

Submission: November 01, 2016, 6:00 pm via Moodle