

## Homework Set 1 - Due September 11, 2012

1. Modify the visualization snippet so that every other sheet of spheres is missing. Render the POV files and create an animation.
2. Modify the visualization snippet so that it incorporates 50 spheres in each direction (not 10) that barely touch. Render the POV files and create an animation.
3. Modify the CppExample code so that it also calculates and writes out the sums of the first through fifth powers of the random numbers it generates.
4. The Fibonacci series is defined by  $x_{n+2}=x_{n+1}+x_n$ . Create a C++ program that computes the first 50 numbers in the sequence starting with  $x_0 = 1$  and  $x_1 = 1$ .
5. Consider the Taylor expansion for the exponential:  $e^{-x} = 1 - \frac{x}{1!} + \frac{x^2}{2!} - \frac{x^3}{3!} + \dots$ ,  $-\infty < x < \infty$ . Write or modify a C++ program that calculates the number of terms required for the expansion to come within 10% of the exact value of the exponential for  $x = 0$ ,  $x = 0.01$ ,  $x=0.1$  and  $x=1$ .
6. Create or modify a C++ program to estimate  $\int_0^3 (81 - x^4) dx$  for  $n = 1, 10, 1,000$  and  $10,000$

Compare your estimates for different  $n$  with the exact values of the integral and explain why the difference has the sign that it does.