



Advanced Topics in Numerical Analysis I Programming Exercise No. 2

(WS 2006/2007)

November 23, 2006

Programming exercise 2

We give the integral representation of the Riemannian Zeta function:

$$\zeta(z) = \frac{2^{z-1}}{z-1} - 2^z \int_0^{\infty} \frac{\sin(z \arctan t)}{(1+t^2)^{z/2}(\exp(\pi t) + 1)} dt .$$

Compute the values $\zeta(-1)$ and $\zeta(-2)$ with an absolute precision of $\varepsilon = 10^{-4}, 10^{-8}, 10^{-10}$.

Instructions:

Choose a suitable integration interval and approximate the integral part with the composite trapezoidal sum.

Compute the composite trapezoidal sum for different $h_j = 2^{-j}h_0$ and extrapolate the results (Romberg-Integration).

Try to minimize the function calls for the evaluation of the integrand. Print out the number of calls.

Please hand in your programming exercise due **Wednesday, December 13, 2006** in computing center. Each 2nd Wednesday a programming exercise will be handed out in the tutorial. The programming exercises are also available for download in the WWW:

<http://www.mathematik.uni-karlsruhe.de/ianm3/lehre/numana12006w> .