

MA228 NUMERICAL ANALYSIS - EXERCISE SHEET 2

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Please hand in your solutions by Friday 29 January 2016, 12:00 am noon.

1. TASK

Let $f : [0, 2\pi] \rightarrow \mathbb{R}$ be the the sinus function restricted to this interval, i.e. $f(x) := \sin(x)$. Assume first you know $f(x)$ only at discrete data points in $[0, 2\pi]$, with 11 such points of your choice, but including 0 and 2π .

2. TASK

Write a MATLAB code which interpolates between the given data points using Lagrange interpolation, i.e. you need to define the 11 Lagrange interpolating polynomials. Alternatively you can solve this task by formulating just pseudo code. Be very clear about what the input and output of the algorithm will be.

3. TASK

Do plot all 11 Lagrange interpolating polynomials, the unique polynomial $P(x)$ of order 10 approximating $f(x)$ at the given data points exactly, and $f(x)$ itself.

4. TASK

Include in your code an error estimate of the given approximation of $f(x)$ by $P(x)$. This error estimate needs not to be exact, but as good as possible. Use your code now with 21 data points (including 0 and 2π), and compute the error estimate again, with exactly the same method you used before to compute the error. Compare the two error estimates. What do you find?