Lund University, Numerical Analysis **Spring Term 2, 2020**
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Numerical Analysis: Basic Course

Assignment 1

Problem 1
Determine a polyomial p of degree smaller or equal to three that fulfills $p(-1) = 2$, $p(0) = 6$, $p(2) = 4$ and $p(3) = 30$ in

a) the Lagrange basis and

b) the Newton basis.

Problem 2
Prove the following theorem:

Given $n+1$ data points (t_i, y_i) with mutually different t_i, there is a unique polynomial $p \in \mathcal{P}_n$ of degree n which solves the interpolation problem

$$p(t_i) = y_i, \quad i = 0, ..., n.$$

Problem 3
Write a python program that plots a given function and an interpolation polynomial. To test this, use the following cases:

a) $f(t) = \exp(-4x^2)$, $t \in [-1, 1]$. As data, use equidistant nodes that include the endpoints and the function values in those nodes. The number of nodes should be 5, then 12.

b) $f(t) = 1/(1 + 25x^2)$, $t \in [-1, 1]$. As data, use equidistant nodes that include the end points and the function values in those nodes. The number of nodes should be 15, then 21.

What do you see?

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