

**Blackboard exam 1**, Mathematics Mathematics 4701, Section TY3  
Starts: 4:30 pm, Thurs, Mar 4; ends: 5:20 pm (late submission loses points).  
Instructor: Attila Máté

*Follow these instructions carefully:*

**Show all your work.** Your explanations count for much more than simple correct answers. Your wording must be your own; using my words will not earn any credit; your explanations must indicate that you understand the material, not simply copy the explanations from somewhere else.

**Do not change the notation in the question.** Changing the notation can result in a serious loss of points. In important cases, you may get zero points for changing the notation. This is especially true for proofs that you may find online or in a textbook with a different notation. Changing the notation to a notation you may find in a publicly available source may be taken as evidence of illegitimate copying, and you may be penalized appropriately.

You must work on your own; collaboration will inevitably show up with similar wordings of the explanations and invalidate your answer. Clear signs of cheating will be taken seriously.

Blackboard allows, but will indicate, late submissions. In case of multiple submissions, only the last one will count.

1. *a)* Find the Lagrange interpolation polynomial  $f(x)$  such that  $f(1) = 11$ ,  $f(3) = 5$ ,  $f(4) = 3$ .  
*b)* Estimate the error of Lagrange interpolation when interpolating  $f(x) = \ln x$  at  $x = 5$ , using the interpolation points  $x_1 = 2$ ,  $x_2 = 3$ , and  $x_3 = 6$ .
2. Find the Newton-Hermite interpolation polynomial for  $f(x)$  with  $f(3) = 5$ ,  $f'(3) = 6$ ,  $f''(3) = -14$ ,  $f(5) = 13$ ,  $f'(5) = -2$ .
  - a)* First, write the divided difference table, using the points 3, 5 in natural order.
  - b)* Using the divided difference table, write the Newton-Hermite interpolation polynomial using the order of points 3, 3, 3, 5, 5.
  - c)* Using the divided difference table, write the Newton-Hermite interpolation polynomial using the order of points 5, 3, 3, 5, 3.