

Experimental Mathematics

MAST90053 2014

Assignment 2

1. (7 marks) Guess the BBP formula for $\log 3$ in base $b = 3^6 = 729$ using PSLQ.
 - (a) Prove your formula (you may use a computer to assist you in finding a proof, but the proof should be easily verifiable without a computer).
 - (b) Implement a digit extractor and compute the millionth and millionth and first digit of $\log 3$ in base $b = 729$ using the BBP formula found in question (a).
2. (8 marks) The associated Laguerre polynomials are defined by

$$L_n^{(\alpha)}(x) = \sum_{k=0}^n (-1)^k \binom{n+\alpha}{n-k} \frac{x^k}{k!}$$

- (a) Use Celine's method to obtain a second-order recurrence relation in n for $L_n^{(\alpha)}(x)$.
- (b) Adapt Celine's method to obtain two linearly independent recurrence relations for $L_n^{(\alpha)}(x)$ that are first-order in both n and α .

DUE DATE: Wednesday 21th May at 6pm. You must have submitted your completed assignment via LMS by this time.

IMPORTANT: You will need to implement your own program and submit an **annotated** and **self-contained Mathematica** notebook.

You must submit a working program to be marked. If you cannot finish the assignment, you should clearly state up to where your code is working, and where it goes wrong. Your notebook file should be named `lastname_initial_assign2.nb`.