

Paper S17 “Numerical Methods” 2006

13 candidates, mean 33.5, SD 7.53

Q1. 1 attempt, mean 16

The only attempt didn't actually start with the maximum likelihood method but rather with a least-squares argument.

Q2. 7 attempts, mean 17, SD 2.94

Part (a) was trivial. Students could manipulate the formulas for part (b), but many made unjustified leaps in their logic, especially near the end when the absolute values were to be introduced. The problem might be improved by getting students to justify the hint, which would re-weight the problem to a particular numerical method rather than the mechanics of proof.

Q3. 9 attempts, mean 17, SD 5.98

Overall this was a pretty straightforward problem. The main hangup was the algebra in part (b). A few students saw that the x 's should be rephrased in terms of $x_0 + nh$, while most tried to solve the system of equations with the x 's themselves, which is potentially quite a bit more tedious. Some of the latter did see a trick, however, which enabled them to compute the coefficients much more quickly. This part might be made less reliant on these tricks by asking the students to rephrase the x 's in one part of the problem.

Q4. 9 attempts, mean 16.3, SD 6.08

Some students didn't realize that part (c) is a slight detour, and tried to get the formula from the result in part (b). Part (d) was perhaps ambiguous to students who didn't realize that the formula in (c) isn't of the predictor-corrector type. This could be improved by swapping parts (b) and (c) and changing “above predictor-corrector” in part (d) to “Improved Euler”.

Some students limited their comparison in parts (d) and (e) to comparing numerical results, with the obvious conclusion that (e) was much closer to the analytic result. This is, strictly speaking, a correct answer to the question (and therefore marked accordingly), but it's more interesting if the student compares the results with the leading terms in an exponential function. The type of comparison sought might have been made more explicit.