Feedback on 36022 Exam, June 2015.

Section A

In question A1, many students could do parts (a) and (c) but wrote nothing at all for part (b). This lost 6 marks. The proof was covered in lectures. The idea is to take a non-zero vector $z$ and show that $z^T A z = 0$ gives a contradiction.

Question A2 was done well by most students. A few students used the incorrect Taylor series expansion of $f$ but obtained most of the marks because the method was correct.

Question A3 was poorly done by most students. This was actually a question from Exercise Sheet 6, so was a seen question. Students who had worked through the sheet should have been able to do this question. Many students considered the error between the true integral $I(f)$ and the quadrature approximation with exact data ($f$-values), rather than looking at the error between the quadrature approximation with exact data and the quadrature approximation with inexact data ($f$-values with errors).

In question A4, most students could write down the Lipschitz condition exactly but there were mistakes in figuring out which of the two given functions satisfied it. The mean value theorem was needed to establish the condition for (2). Very similar examples were given on Exercise Sheet 7.

In question A5, most students conveyed the main points but many were unable to properly define the polynomial used to replace the integrand.

Section B

In question B6, most students could state the leading term of $T_{n+1}$ in part (a) and knew the definition of an alternant in part (b). However, there were a lot mistakes in part (c) (many students thought the best approximation was $p_0 = 0$). Part (e) was also poorly done by most students. The best $L_\infty$ approximation from the set of polynomials of degree zero was covered in lectures. The rationale for choosing Chebyshev points as interpolation points was covered in lectures also. See the online notes ‘Interpolation with Chebyshev points’.

In question B7, many students missed out part (b) completely. We proved this result in lectures. I went over part (a) in the revision class (a similar question was posed on the 2014 exam, which I went over). Part (c) was well done by most students. I went over a similar example in the revision class. Similar examples were also posed on Exercise Sheet 6. See also the online notes ‘Introduction to Gauss Quadrature’.

Average marks for question B8 were high. Most students did this question very well. There was some confusion, however, about the definition of truncation error. Many students also confused $y_n$ (an approximate value) with $y(x_n)$ (an exact value) in parts (b) and (c). Many students could not do Taylor series in two dimensions and so tried to reverse engineer a calculation from the given answer. Marks were lost for this.