Temple 3043 Numerical Analysis I Fall 2011

Problem Set 2

(Out Mon 09/12/2011, Due Tue 09/20/2011)

Instructions

Any problem given by a number (and page reference) is taken from the book
Brian Bradie, *A Friendly Introduction to Numerical Analysis*, Pearson Prentice Hall, 2006.

- Problems marked with **(T)** are theory problems. Their solutions are to be submitted on paper.
- Problems marked with **(P)** are practical problems, and require the use of the computer. Their solutions are to be submitted on paper, and usually require two parts: (a) a description of the underlying theory; and (b) code segments, printouts of program outputs, plots, and whatever it required to convince the grader that you have understood the theory and addressed all practical challenges appropriately.

Problem A

(T) Assuming a perfectly spherical and flat earth ($R = 6371$km), set up a formula (based directly on the Pythagorean theorem) for the distance to the horizon d as seen from height h.

(a) Calculate d for (i) a sparrow ($h = 5$cm), (ii) a human ($h = 1.5$m), and (iii) a human on the top floor of the Burj Khalifa ($h = 621.3\text{m} + 1.5\text{m}$).

(b) Now perform the same calculations in floating point arithmetics using $F(10, 7, -\infty, \infty)$. Report the relative round-off errors in the results.

(c) Rewrite the formula above in a way that cancelations errors are reduced. Perform the floating point calculations using your new formula, and report the relative round-off errors.

Section 1.3 (pages 39–41)

(T) 13. **(T)** 14. **(T)** 17. **(T)&(P)** 18.

Section 1.4 (pages 50–53)

(T)&(P) 4. **(T)** 5. **(T)** 15.