Temple 3043 Numerical Analysis I Fall 2011

Problem Set 9

(Out Mon 10/31/2011, Due Tue 11/08/2011)

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 D

Consider the mapping $F : \mathbb{R}^2 \to \mathbb{R}^2$, defined by $F(x, y) = (x - y^3, y - x^3)$, which has three zeros: $(-1, -1)$, $(0, 0)$, and $(1, 1)$. Create a color image by the following rule. For each point $(x, y) \in [-4, 4]^2$, run Newton iteration until convergence, and color the point {green, blue, red}, if Newton iteration converges to $\{(-1, -1)$, $(0, 0)$, $(1, 1)\}$. Use a resolution of at least 500×500 starting points to obtain a nice image.

Section 4.1 (pages 277–280)

(P) 9. **(P)** 12. **(P)** 16.

Section 4.2 (pages 291–296)

(T)&(P) 9. (It might be helpful to write a Matlab program that automatically sketches the Gerschgorin circles for a given matrix.)
(T) 26. **(P)** 28.(a)

Section 4.3 (pages 304–308)

(P) 7.