MACM 202 Assignment 1, Spring 2004

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This assignment is worth 10% of your grade. It is due Wednesday January 21st at 10am. A late penalty of 20% will apply for each day late. The use of Maple on this assignment is compulsory. Do each question in a separate Maple worksheet. Hand in a printout of each worksheet. Attempt all questions.

Questions 1.5, 1.7, 1.12, 1.17, 1.18, 1.20 from the text and the following two.

Theorem 1 does not say what happens when $f'(x*) = \pm 1$. Let $f(x) = ax^2 + bx + c$ where $a \neq 0$. Find numerical values for a, b, c such that $f(x)$ has a fixed point $x*$ with $|f'(x*)| = 1$. Determine and explain the behaviour of the iteration on both sides of the fixed point.

Consider the polynomials

$$f_1(x) = x^8 - 1, \quad f_2(x) = x^8 + 1, f_3(x) = x^8 - x - 1, \quad f_4(x) = x^8 + x + 1.$$

Factor each of the polynomials using the `factor` command. Solve each polynomial for its roots first using the `solve` command and then using the `fsolve` command. Notice that some roots are complex. Find out how to get `fsolve` to compute all 8 complex roots. Apply the `evalf` command to the values returned by the `solve` command to verify that they are the same as those computed by the `fsolve` command. Now explain what the `solve` command does. Explain why `solve` sometimes returns roots involving sines and cosines and RootOfs in the output.

Notes.

1. In question 1.5 use $r = 1.75 \times 10^{-4}$ not $1.74 \times 10^{+4}$ as in the text.
2. When you use Maple to draw graphs of functions, you must choose a reasonable domain for the plot. Also, in order to visually locate fixed points and determine their stability, please graph the function $y = x$ on the same plot.
3. Questions 1.12, 1.17, 1.18, which ask you to *show* the location of any maxima, minima, and inflection points. Instead, compute where the maxima and minima are using Maple.