Homework 2
Due on Thursday, Sep 29

Writing problems: (Hand in your solutions before the lecture on Sep 29)

Problem 1: Exercise set 2.1: 12, page 54 of the text

Problem 2: Exercise set 2.1: 14, page 54 of the text

Problem 3: Exercise set 2.1: 15, page 54 of the text

Problem 4: Exercise set 2.1: 15, page 54 of the text

Problem 5: Exercise set 2.2: 1(a)(b); 2, page 63 of the text

Problem 6: Exercise set 2.2: 6, page 63 of the text

Programming problems: (Send your code and a brief report to 2011fall.na@gmail.com)

Problem 7: Consider the following two formulas, which are analytically the same, but numerically different:

\[ f_1(x) = \frac{1 - \cos x}{x^2}, \quad f_2(x) = \frac{\sin^2 x}{x^2(1 + \cos x)} \]

Use a sequence of \( x_k = \frac{k\pi}{K}, k = 0, \ldots, K - 1 \) (for example \( K = 8, 20, 50, 100 \)) to illustrate when the computation of \( f_2(x) \) encounters an overflow/underflow problem.
Problem 8:

Find a solution of $x^3 = x^2 + x + 1$ using the bisection method.

(a) Precise the initial interval you choose and justify your choice.

(b) Use the stopping criterion $|p_n - p_{n-1}| \leq 10^{-4}$. Output $p_n, f(p_n)$ and $|p_n - p_{n-1}|$.

(c) Plot the graph of $|p_n - p_{n-1}|$ verus $n$ and $|f(p_n)|$ verus $n$ using a plot program (ex: Matlab command ”plot([1 : n - 1], Δp)” where $Δp$ is the vector $|p_n - p_{n-1}|$).

Problem 9: Solve the problem 18 in Section 2.1, page 55 using the bisection method.