

Boğaziçi University
Department of Physics

Phys 496/68N

Fall 2011

Problem Set 2
Due on November 4th, 2011

Problem 1

You will use binary search method to solve this problem. Consider the following function:

$$f(x) = x^2 - 5 \quad \longrightarrow \quad x_0 = 5^{1/2} = 2.236068$$

- a) Start with $x_i = 1$ initial guess, and $dx = 0.5$ step size, find the root of $f(x)$ with a tolerance of 10^{-6} . How many step did it use to find it? Print i) the x at every step, ii) error $(x - x_0)$ at every step, and iii) the iteration number.
- b) Start with $x_i = -3$, $dx = 0.5$, do the same.
- c) What happens when $x_i = -3$, $dx = 6$?

Problem 2

Solve $f(x) = x^2 - 5$ using Newton-Raphson method with $x_{\text{initial}} = 3$ assume that you know $f'(x) = 2x$. Print out the same diagnostic information as you did for the first problem. How many iterations were necessary for a tolerance of 10^{-6} ?

Problem 3 – [*Optional for Phys 496 - mandatory for Phys 68N students*]

Modify your Newton-Raphson code to use approximated $f'(x)$. Did the number of iteration improve or worsen?