

HW1

M 5750-2. Fall 2011. Optimization methods
Due September 5, 2011

Approximate the minimum of unimodal function $f(x)$ where x is a real number $x \in [a, b]$, approximate or locate $x_* = \operatorname{argmin} f(x)$, using

- (a) Fibonacci search method (5 steps),
- (b) Golden ratio search method (5 steps),
- (c) Newton method with modifications (compute 4 steps). If Newton method fails, explain why and suggest an improvement.

Use the following unimodal test functions $f(x)$

$$f_1(x) = -.2x^4 + x^2 - x, \quad x \in [-1; 1], \quad x_0 = -1. \quad (1)$$

$$f_2(x) = 1 - \exp(-x^2), \quad x \in [-3; 3], \quad x_0 = -2.5. \quad (2)$$

$$f_3(x) = \sqrt{x^2 + .3}, \quad x \in [-3; 3], \quad x_0 = -2. \quad (3)$$

$$f_4(x) = \max\{\sqrt{2-x}, \sqrt{2+x}\}, \quad x \in [-2; 2], \quad x_0 = -1.5. \quad (4)$$

Plot the functions, list the points of evaluation.