HW1

M 5750-2. Fall 2010. Optimization methods
Due September 3, 2010

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

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

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

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

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

Plot the functions, list the points of evaluation.