MATH 170B: Discussion 3

Apr 2018

Newton's method

This Discussion we will talk about Newton's method.

1. **Section 3.2.6** To compute reciprocals without division, we can solve $x = \frac{1}{y}$ by finding a zero of the function $f(x) = x^{-1} - y$. Write down the formula of Newton's method to find the root of this function.

2. Given a quadratic function $f(x) = x^2 + 1$. It is obvious that this function has no 0 root. Suppose we want to find the minimizer of this function. Given a starting point $x_0 = 1$, write down one iteration of the Newton's method for this function.

3. Consider the function $f : \mathbb{R}^3 \to \mathbb{R}$ such that

$$f(x) = e^{x_3}x_1^2 + x_2^2 + x_3^2 \cos x_1 \tag{1}$$

Suppose we want to find the minimizer of this function. Given starting point $x_0 = [0, 0, -1]^T$, compute one iteration of Newton method.

4. If Newton's method is used with $f(x) = x^2 - 1$ and $x_0 = 10^{10}$, how many steps are required to obtain the root with accuracy 1?