

Problem 49.11. Show that the function f given by $f(x) = \log(e^x + e^{-x})$ has a unique minimum for $x^* = 0$. Run Newton's method with fixed step size $t = 1$, starting with $x_0 = 1$, and then $x_0 = 1.1$. What do you observe?

Problem 49.12. Write a Matlab program implementing the conjugate gradient method. Test your program with the $n \times n$ matrix

$$A_n = \begin{pmatrix} 2 & -1 & 0 & \cdots & 0 \\ -1 & 2 & -1 & \cdots & 0 \\ \vdots & \ddots & \ddots & \ddots & \vdots \\ 0 & \cdots & -1 & 2 & -1 \\ 0 & \cdots & 0 & -1 & 2 \end{pmatrix}$$

and various right-hand sides, for various values of n . Verify that the running time is $O(n^{3/2})$.