

Homework 8 :: MATH 504 :: Due Tuesday, Nov 1st, 11:59 pm

Your homework submission must be a single pdf called “LASTNAME-hw7.pdf” with your solutions to all theory problem to receive full credit. All answers must be typed in Latex.

1. Let $f(x) = -x_1^2 - 4x_2^2$. Consider two different points

$$\tilde{x} = [2, 0]^T \quad \text{and} \quad \bar{x} = [\sqrt{3}, 1/2]^T$$

Show that

$$\nabla f(\tilde{x})^T x'(\tilde{t}) = \nabla f(\bar{x})^T x'(\bar{t}) = 0.$$

Hint: Consider the level set of f at the level $c = -4$. Define a parametric curve of a curve passing through \tilde{x} and \bar{x} , similar to what we did in lecture.

2. Consider the system of equations

$$(x - 1)^2 + (y - 1)^2 - 1 = 0$$

$$x + y - 1 = 0$$

- a. Draw the set of points on the plane that satisfy each equation, and indicate the solutions of the system.
- b. Solve the system exactly.
- c. Apply Newton's method twice with $[x_0, y_0]^T = [1/2, 1/2]^T$. Illustrate the corresponding steps geometrically.
- d. (MatLab) Write a code to solve this problem and plot the trajectory of solution in a xy plane, for $N = 30$ iterations.