

AEM 685: Homework # 1

Due on 08/31/2015

Important: Please work independently.

Problem 1: For the function,

$$F(x, y) = x^4 - y^4$$

$$-2 \leq x \leq 2$$

$$-2 \leq y \leq 2$$

find the stationary points; classify the stationary point (maxima, minima or inflection point or saddle) using gradient, Hessian matrix and higher order Taylor series expansion. (20 points)

Problem 2: For the optimization problem,

$$\text{Minimize } f(x_1, x_2) = -0.2262x_1x_2$$

$$\text{Subject to } g(x_1, x_2) = 0.12x_2 - 0.07x_1 - 0.12 \leq 0$$

$$0 \leq x_1 \leq 1$$

$$0 \leq x_2 \leq 1$$

plot the objective function using contour plot and show the constraint and define the feasible and infeasible domains using Matlab (30 points)

Problem 3: For the optimization problem,

$$\text{Minimize } f(x_1, x_2) = -0.2262x_1x_2$$

$$\text{Subject to } g(x_1, x_2) = 0.12x_2 - 0.07x_1 - 0.12 \leq 0$$

$$h(x_1, x_2) = -5.6549x_1 - 1.131x_2 +$$

$$\pi\sqrt{(0.18x_1 + 0.12x_2)(0.6x_1 + 0.36x_2)} + 1.75 = 0$$

$$0 \leq x_1 \leq 1$$

$$0 \leq x_2 \leq 1$$

solve the optimization problem using Karush-Kuhn-Tucker conditions. Show the gradients of the objective function, and the constraints in Matlab plot. (40 points)